ELECTRICAL REVIEW

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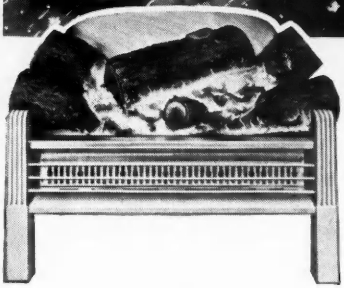

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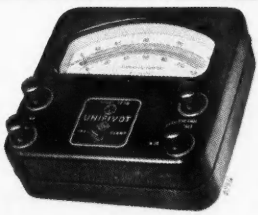

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ELECTRICAL REVIEW

23rd JANUARY, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLII • NO. 4

Oil Firing

SUITABLE sites for power stations are particularly difficult to find in London, and transmission of peak loads is uneconomic and generally impracticable. Space limitations often preclude the bulk storage of coal which would be out of keeping with schemes of building development, such as that envisaged for the south side of the River Thames. Fuel oil is without many of the objections to coal and possesses advantages in ease of delivery on site and closeness of control with varying loads. The new Bankside power station, described in this issue, has been designed to meet objections to a structure which, it was feared, might be out of keeping with St. Paul's Cathedral and projected buildings, and which might also cause material damage to them by emitting sulphur dioxide from its chimneys. Government sanction was given to the construction of the station on condition that oil should be used for firing the boilers and that the flue gases should be washed before being discharged to the atmosphere. Architecturally the station with its single brick chimney is, we believe, generally held to conform to the requisite principle of dignified simplicity. It certainly presents a contrast to the adjacent seventy-year-old Bankside " A " with its numerous steel stacks. The veteran will, however, have to remain until its 74 MW of generating plant can be spared to make room for the second half of the " B " station. Bankside " B " is the first large station in this country to be initially planned to rely entirely on oil fuel. It is also the first, we believe, to be intended from the outset for two-shift operation. The two aspects are unfortunately interrelated. The cost of oil fuel per kWh will probably be about 50 per cent more than that of coal and a departure is made from the normal procedure of carrying the base load on new plants and only later relegating them to peak load duty. The second stipulation, regarding gas washing, increases considerably both capital and maintenance charges. Even at the high technical efficiencies of the effluent method chosen, with oil of relatively high sulphur content

(as compared with coal), its effectiveness for its purpose cannot be taken for granted for reasons advanced in our issue of 19th December. The new station, therefore, while providing sorely needed MW capacity, cannot be expected to vie with other modern stations in lowering the generating costs of the country.

OBJECTIONABLE CONTROL

At a meeting with the Minister of Supply last week representatives of engineering and allied concerns which have their own iron foundry arrangements reluctantly agreed to withdraw their opposition to the Iron and Steel Bill upon the Minister's assurance that the powers of the proposed Iron and Steel Board would be circumscribed. The complaint was that while their establishments remained uncontrolled when the iron and steel industry was nationalized, a denationalization measure put them under supervision. They were not over-impressed by the Minister's contention that this was necessary in their own interests, to ensure a fair share of available materials, and they feared the possibilities of the Board's control of prices and development. The Minister was evidently convinced by the arguments, for the amendments announced during last week-end appear to remove the objectionable (and also unnecessary) features from the Bill.

OUTPUT RECOVERS

For a time during last summer the fall in electricity consumption caused concern. Any loss of revenue could only be met by further increases in charges in addition to those necessitated by higher costs. In the event the policy of the Area Boards of avoiding hasty measures would seem to have been justified, for during the last three months of the year there was a definite recovery in output (partly influenced by the colder weather). At the same time the year's increase in sales of 4 per cent compares with the 9 per cent of additional plant installed. The good progress which the latter figure represents, by removing the fear of power cuts, will do more than anything else to ensure the steady expansion of the industry.

PLANT PROGRESS

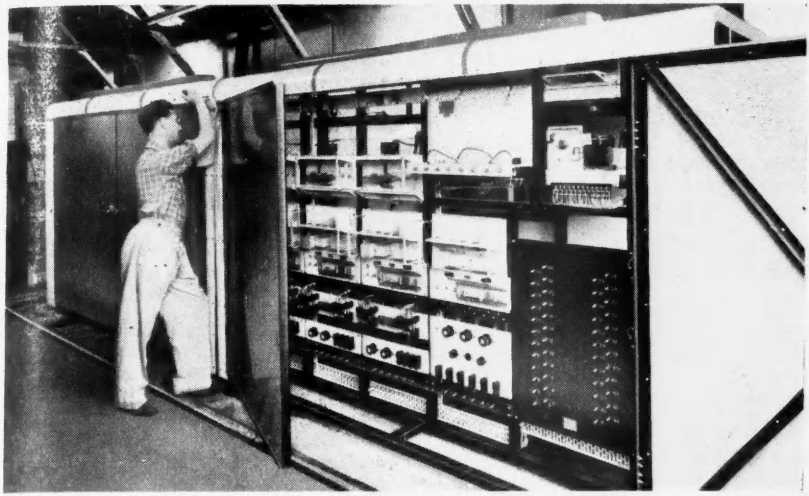
The appreciation of the electrical industry of the achievement by the British Electricity Authority of an additional 1,539 MW of new plant last year receives backing from the *Economist*. That journal says:—

> "Since vesting day, the supply industry has added roughly 4¼ million kW of output capacity to its power stations—which certainly constitutes the largest single slice of capital investment for any industry in post-war years. The single-mindedness with which this has been carried through has impressed even the authority's critics and those industries that have suffered from competing with B.E.A. for similar types of equipment."

The *Economist* might also have praised the electrical manufacturers for their part in this achievement while fulfilling a heavy export programme.

COAL ECONOMY

As coal represents irreplaceable stored national capital, Mr. W. E. P. Johnson in his Royal Society of Arts lecture (reported on another page) suggested the diversion of "huge industrial resources" to reduce its consumption. A less drastic way would be to increase electrification. While reserves of certain qualities may be rapidly diminishing, the reserves of the low-grade type usable for generating electricity are far greater than bulk statistics indicate. The virtual absence of any other market brings it almost into the category of the alternative power sources now being investigated. Although these are generally scattered and too small individually to make any substantial contribution, their output, if electrical, could readily be transmitted by the grid to points of utilization.



Electronic Control

Production of Special Equipment at Rugeley

THE word "electronic" has unfortunately come to be used largely in popular parlance as synonymous with (if perhaps somewhat superior to) "electric." As regards the Rugeley firm of Lancashire Dynamo Electronic Products, Ltd. (formerly British Electronic Products, Ltd.), however, the word retains the more restricted sense in which it is used in the electrical industry, implying connection with electrons and reliance on thermionic valves. Each of this company's diverse range of products, from a simple photo-electric equipment to a complicated integrated multi-motor control system for a steelworks, depends for its operation on the application of one type of valve or another and the company now claims to be the largest manufacturer engaged solely on industrial electronic control equipment in the country.

It is only six years ago that a small group of specialist electronic engineers formed the company in association with the directors of the Woden Transformer Co., Ltd., operations commencing in part of that company's Bilston factory. Early in 1948 the company was reorganized and additional capital introduced, production and development facilities being transferred to the present factory at Rugeley. In 1950 the company joined the Lancashire Dynamo group.

Reconstruction and modernization of the factory at Rugeley—originally an old mansion—have proceeded as fast as building restrictions would permit and recently the first major extension has been completed and put into commission, comprising an entirely new single-storey building for the main assembly and test department. The completion of this extension has made possible the much-needed expansion of the laboratories, engineering and design departments, drawing and general offices, stores, packing and despatch departments. The

Typical multi-motor line drive equipment using standardized electronic motor control plug-in chassis (valves removed)

alterations and extensions so far carried out are, however, regarded as being temporary measures; plans for a considerably larger factory of a permanent nature on a neighbouring site are already in preparation.

In view of the highly specialized nature of the products the technique of manufacturing procedure adopted differs somewhat from those normally used. Mass production is out of the question, but the batch production methods developed utilize as far as possible standard components or sub-assemblies.

Inquiries are dealt with initially by the engineering department, a group of technicians responsible for producing basic specifications for equipment to customers' requirements. After an order has been received, these specifications and other relevant information are passed to the design department, which prepares the circuit design, component specifications, etc., generally providing all technical information necessary for the manufacture of the equipment. The drawing office then converts this information into a standard form which the works can use. The laboratories, which are concerned primarily with development work, can be called upon by other departments to assist in solving technical problems which may arise.

An interesting system of production adopted makes use of boards at strategic positions in the factory to show at a glance, by means of tiny cards inserted in transparent coloured envelopes, the stage reached by every order in hand. It takes a girl (with no special training) half an hour a day to keep the system up to date and a six-monthly routine check reveals almost negligible errors.

Although such a wide range of products is manufactured, the company has devised a system of general classification. The first group covers rectifier motor drives, employing some form of electronic rectification, in particular thyratrons. Drives of this type are particularly suited to specialized applications where automatic control is required, for example, the control of pressure, flow, etc.; reeling and coiling drives; and multi-motor drives for textile machines, wire drawing machines, etc.

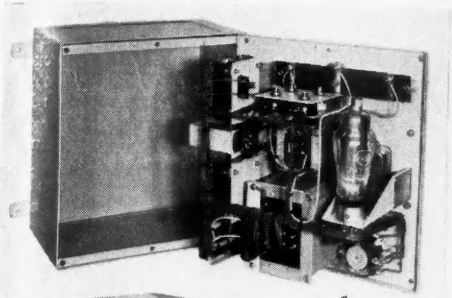
Electronically controlled motor generator sets form the next product group and apart from those applications using the characteristics of this type of power conversion to provide inherent regeneration on deceleration, such as hosiery knitting machine drives, many other special applications requiring higher power drives have been met with this type of scheme in the steel, paper, textile and food industries.

The third product group covers special high accuracy regulator equipment for voltage, current, speed, frequency, etc. Voltage regulators for d.c. supplies (with an accuracy of $\pm 0{\cdot}1$ per cent) have been applied to film processing by many leading companies in this country and abroad and similar regulators for alternators are being used in many of the large scale electronic computer projects.

Equipment for process control forms another important branch of the company's business, various schemes being applied to the control of temperature, pressure, flow, etc. Such schemes generally require the controlled variable to be recorded and a disc chart recorder has been developed for this purpose. Perhaps one of the most interesting applications in the process control group is for the automatic control of the operating cycle on sugar centrifuges, where the convenience of time adjustment and the ease with which complex interrelationship of the time intervals can be provided offer many advantages over mechanical types of timer. One of the earliest units installed contained 72 valves and has now been operating successfully for many years. This emphasizes the experience found with all types of equipment that valve faults are a rare cause of equipment failure. Profile following equipment for copying operations on machine tools is another item in the process control group.

The wide range of photo-electric equipment forming the next group includes, apart from simple photo-electric switching units, colour sorting equipment, edge

See opposite page: **(1) Interior of a simple electronic motor control unit of ½ h.p. rating showing controlled thyratron rectifier. (2) Interior of electronic motor control equipment showing field chassis being removed. (3) This special 32-interval process timer having eight plug-in four-interval timer units is typical of equipment supplied for sugar centrifuge and similar control. (4) Standard plug-in unit timers for process control applications. The basic unit covers 1 min and multiplier units extend this to 15 min. (5) A typical packaged motor generator set control for 2·5 h.p. with motor generator set on anti-vibration mountings and plug-in electronic excitation unit. (6) Interior of typical high accuracy alternator voltage regulator showing removable plug-in chassis and accessibility**



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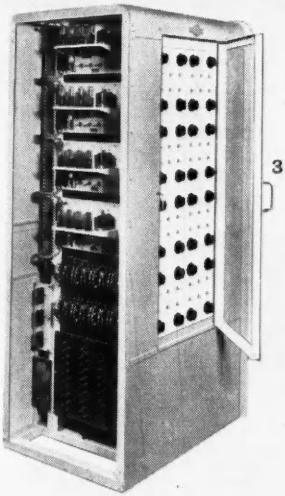

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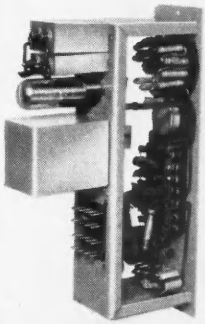

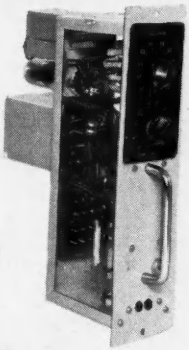

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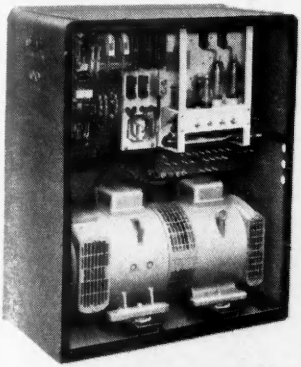

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register controls for metals, paper, textiles, etc., moderate and high speed counting, gauging (by the hole-in-scale method), street lighting control, burglar alarms, press and machine guards and equipment for the detection of pinholes in ferrous and non-ferrous strip, these examples covering just a few of the applications of photo-electric equipment, under which heading are also included radiation pyrometers.

Protective and supervisory equipment embraces phase failure relays, relays for operating at definite current levels to give over-riding indication or control, power factor correction apparatus operating on reactive kVA, check synchronizing equipment for paralleling alternators, and various operating devices, including grain pulverizer controls which regulate the feed of grain so as to maintain constant electrical load on the main pulverizer motor.

Although not marketing radio frequency heaters itself the company supplies a considerable amount of this class of equipment to other manufacturers. Apart from resistance welding control equipment, which forms a large and important section of the company's business, a comprehensive range of this type of equipment being manufactured, the remainder of the company's production is termed "special equipment" and includes such items as high speed counters (up to 100,000 impulses/sec), time measuring equipment and high accuracy high speed tachometers for jet turbine work, etc., high power stroboscopes, specialized power supply equipment and a large group of articles designated for obvious reasons "one customer products."

It is, of course, impossible to see examples of every type of product during a single visit to the works. When we were there recently we were unable to see any equipments comparable in size with the 30ft by 4ft by 6ft control equipment for a steel works line drive, which is the largest single equipment so far produced, but we did see a number of medium sized control equipments for textile machines, biscuit making machines and similar applications.

An interesting equipment was a 10ft by 6ft by 3ft controller for an experimental sugar centrifuge drive, operating on the electronic Ward-Leonard principle, providing exact control of a number of adjustable acceleration rates as well as automatic timing for the various operations associated with the centrifuge. This equipment, which is eventually destined for the Imperial School of Tropical Agriculture, Trinidad, is, in conformity with the company's usual practice for equipment intended for the food industry, finished in cream; other products are normally in two-tone grey.

This controller, like a smaller unit for timing control only to be installed in a

(1) Withdrawable tray construction is used extensively. Here the synchronous timer tray of a comprehensive resistance welding control installation is shown withdrawn. (2) New design photo-electric lighting control in weatherproof neoprene sealed cast light alloy case. (3) Ignitron welding contactor of open type for "building into" customers' equipment. It is fitted with a water-flow switch

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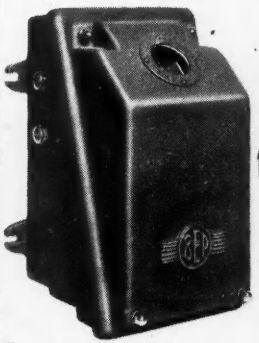

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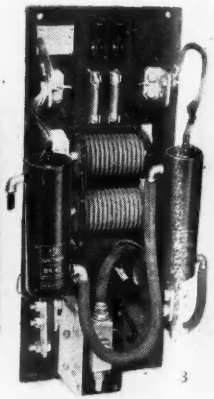

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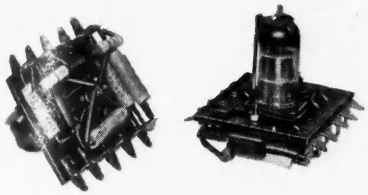
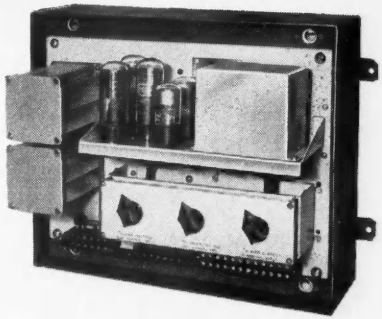


Above : **Binary unit which is used extensively in counters and computers**



Right : **Interior of overvoltage/undervoltage/ overcurrent relay suitable for operation up to 10,000 c/s**

refinery in Belgium, also demonstrates the method of " unitization " of products, individual control units being mounted on chassis which are plugged into the main control cubicle and can be readily withdrawn for inspection or replacement.

A photo-electric equipment for the fully automatic control of a machine for bias cutting of rubber to be installed in an overseas factory of a well-known tyre manufacturer was nearing completion, together with synchronous resistance welding controls, a ten motor textile machine drive control incorporating thyratrons, power factor regulation units, an acoustic control for detecting metal in cocoa pulverizers and a number of automatic control units for laundry hydro-extractors giving a fully automatic acceleration, brake and stop sequence. In the test section, which has facilities for dealing with equipment of ratings up to 50 h.p. at 50 or 60 c/s, we saw a typical alternator control desk for a Gas Board. A feature of all the desks manufactured is the use of overall " Perspex " labels which are back engraved so that all markings are permanently protected. It was noticed in the test section that there is complete inspection and marking of all soldered joints and component fixings.

We thank Mr. R. J. F. Howard, the company's chief engineer, for showing us round the works, and otherwise assisting us in preparing this article.

POWER STATION LIGHTING

Special Requirements in Boiler House and Control Room

SOME aspects of power station lighting were outlined by Mr. P. D. Figgis in a paper presented at a meeting of the Illuminating Engineering Society held in London on 13th January.

The author commenced by explaining that normal street lighting and area floodlighting methods could be used externally around generating stations, though additional light was needed for unloading and reclaiming coal and it was usually provided by floodlighting projectors attached to cranes and grab towers.

Dust-excluding or dust-free fittings should be installed throughout the boiler house and all fittings should be readily accessible for maintenance. General illumination should be 6 lm/sq ft over all working areas, except the firing aisle which should have from 10 to 12 lm/sq ft. The turbine house, also needing from 10 to 12 lm/sq ft at operating floor level, could have overhead or side lighting. Tungsten filament lamps of large wattage in high-bay, or concentrating, reflectors might be used or mixed light from mercury vapour combined with filament lamps, though multi-lamp fluorescent panels were more efficient. Side lighting with fluorescent lamps was now a practical proposition and probably the best method. Either way maintenance was best carried out from the travelling crane.

From 20 to 30 lm/sq ft was needed in the control room and care was required to minimize reflections in the glass fronts of meter and instrument cases. Since control room duty was a 24-hour one it was desirable to secure the correct brightness distribution and a cheerful atmosphere. The need for an emergency lighting system was pointed out.

VIEWS on the NEWS

By REFLECTOR

ELECTRICITY is doing fairly well in television but I am anxious to see even more. There have been reports of negotiations between the B.B.C. and film producers with a view to getting more films for the television programmes. The B.B.C. must be aware of one source of films already easily to hand—the British Electrical Development Association. Many of the E.D.A. films have real entertainment and instructional value. The electrical message is imparted in a very gentle manner and if the B.B.C. has any fears about this it should ask to see some of the E.D.A. productions. I feel certain that the results will be satisfactory to both parties.

* * *

Proceeding on a suggestion made by the Caernarvonshire County Council, the Association of Welsh Local Authorities has asked its members to consider the question of urging that Wales should have a separate authority for the generation and distribution of electricity. The whole of the Principality's gas is supplied by a Welsh Board. It seems probable that there will be a north-south division on this question. South Wales, which has its own Electricity Board, is unlikely to regard an all-Wales authority as an improvement; indeed Aberdare has declined to support the proposal. North Wales (from which the idea emanates) does not like the B.E.A. and also feels itself to be a mere appendage of the Merseyside Area.

* * *

Mr. L. G. Udall (London, S.W.20) has written to *The Times* complaining that if he wishes to make good a broken plastic switch cover he is forced to replace the switch, having been told that spare parts are not sold separately. I agree with him that this is "extremely uneconomic." It may seem to be good business to sell a new switch for the sake of a broken cover but it irritates the victim and is not good propaganda for the electrical industry. This applies with even more force in the case of socket outlets which are usually in more vulnerable positions and more expensive to replace.

* * *

On previous occasions I have championed the cause of consumers who prefer prepayment to "quarterly" meters but there is one drawback which gets prominence now and again. It is that these meters hoard shillings and create a scarcity of these coins. The latest complaint on this score comes from the East Midlands Area. According to an official of the Board there are about 30,000 prepayment consumers in the area and the average amount collected from each is £2. It can thus be calculated that if all the meters remain unemptied at any one time 1,200,000 shillings are immobilized. But I cannot think that this can happen very often with the usual continuous meter reading system.

* * *

A correspondent of the *Windsor Express* complains that his quarterly account for electricity arrived on Christmas morning. While I agree that it is a pity that an Electricity Board should thus follow the bad example of the Inland Revenue Department, the complainant can at least comfort himself with the thought that he has received value for his money. It is doubtful whether the same could be said about income tax.

* * *

Proper cleaning and maintenance of electric light fittings makes a tremendous difference to efficiency but is often neglected. Even so I have yet to hear of such conditions as seem to prevail at Lancing, Sussex, where, according to the *Worthing Gazette*, a member of the Parish Council alleged that in a certain road there were potholes seven or eight inches deep and the gaslights were hidden in birds' nests.

A.C. Oil Circuit Breakers

A Comparison of the Old and New Standard Specifications

By D. E. LAMBERT, B.Sc., A.K.C., M.I.E.E.*

THE recently completed British Standard 116 : 1952 for oil circuit breakers for a.c. systems is now available. The differences between the requirements of the 1937 and the new editions are pointed out below under the titles of the main sections of the Standard, but such a brief review as this cannot give full details of the Standard, which obviously must itself be read for complete understanding of its contents.

General

Oil switches and oil isolating switches which were included in B.S. 116 : 1937 are now to become the subjects of other Standards at present in course of preparation. Since 1937 the design and construction of oil switches have changed to meet service requirements and the relevant rating and performance clauses in B.S. 116 : 1937 have consequently become inadequate and need considerable amplification. With this fact in mind it was considered desirable to limit the scope of B.S. 116 to circuit breakers only and to publish the revision now rather than to wait for the completion of a Standard including also switches and isolators.

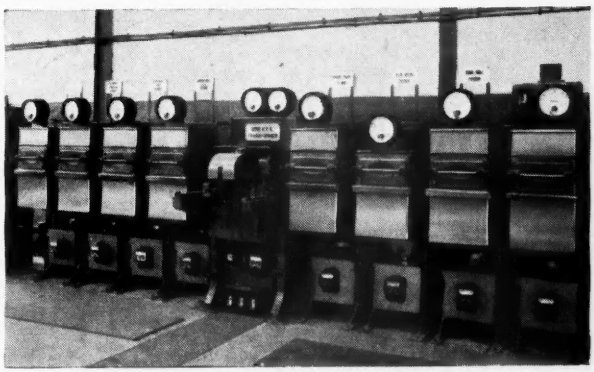
The voltage range of the Standard has been extended to include circuit breakers with rated service voltages of from 415 V to 275 kV. B.S. 936: 1940, however, still applies to oil circuit breakers for rated service voltages up to and including 660 V.

The use of prospective current has been introduced for the rating and performance of circuit breakers of some types, particularly those for medium voltage, which have the property of exercising a modifying effect upon the short circuit current.

Circuit breakers are classified in the new Standard into two groups: Group A have three-phase breaking capacity ratings up to 500 MVA (and single-phase breaking capacity ratings up to $500/\sqrt{3}$ MVA) while Group B have three-phase breaking capacity ratings above 500 MVA. This grouping corresponds to the division of the former edition into Parts 1 and 2, but the new arrangement is simpler and avoids much repetition. The short circuit testing of circuit breakers rated at over 500 MVA, particularly with regard to recovery voltage, is the same as for Part 2 of B.S. 116 : 1937.

* The author is with A. Reyrolle & Co., Ltd., and has been a prominent member of B.S.I. and B.E.A.M.A. committees concerned with the revision of this important specification.

Typical heavy duty circuit breakers for medium voltage as now covered by B.S. 116 : 1952



A number of new definitions have been introduced, most of them concerned with system earthing and insulation co-ordination or relating to clauses dealing with these subjects in the specification.

Ratings

In the 1937 edition of the Standard there were three tables of ratings (voltage, normal current and three-phase MVA breaking capacity) with Table 4, which was a schedule of standard breakers correlating the values in Tables 1, 2 and 3. In the new edition there are only two tables, one being the complete list of standard ratings and the other for the guidance of users, and with the aim of eventual rationalization of sizes, being a much reduced list of preferred ratings.

The voltage ratings and breaking capacity ratings of single-phase circuit breakers and breakers for neutral earthing are introduced for the first time into this Standard. For neutral earthing breakers the voltage rating is $1/\sqrt{3}$ of the three-phase voltage rating and the breaking capacity is $\frac{1}{3}$ of the standard MVA values. Thus breaking capacity rating, in current, of a neutral earthing circuit breaker is one of the standard values of symmetrical breaking current corresponding to a three-phase service voltage of $\sqrt{3}$ times the rated service voltage of the neutral earthing circuit breaker.

There has been a change in the Standard in respect of rated short-time current. In the 1937 edition two short-time current durations were specified, namely one second for a current not less than the rated symmetrical breaking current and five seconds for a current to be stated by the manufacturers. In the 1952 edition alternative short-time current durations are specified for a current not less than the rated symmetrical breaking current according to the ratio of rated breaking current to rated normal current. If the ratio exceeds 40 : 1, the short-time duration specified is one second. If it is equal to, or less than, 40 : 1, the short-time duration is three seconds. The change has been made primarily to meet modern conditions of protection, and the introduction of a one-second rating for circuit breakers with the smaller rated normal currents has been influenced by thermal considerations.

For shunt trip-coils, operating limits are given for operation under short circuit conditions as well as for no-load routine tests.

Service Conditions

An entirely new section has been introduced dealing with service conditions, covering system earthing, ambient temperature, altitude, atmospheric conditions and the operating duty of the breaker. Some of these conditions were previously covered in an appendix. Standard breakers are related to these conditions, particular emphasis being laid on the fact that breakers complying with the revised specification are suitable for use in three-phase systems in which one of the neutral points of the system is permanently earthed either solidly or through a resistor or reactor of low impedance, in systems earthed through an arc-suppression coil (where faults are not allowed to remain on the line indefinitely) and in single-phase systems having one line earthed. Standard breakers are not necessarily suitable for use in three-phase systems the neutral points of which are insulated from earth.

Operation in Service

The condition of the breaker after performing its rated short circuit operating duty has been defined more precisely in respect of its ability to carry rated normal current. A temperature rise not more than 10 deg C in excess of that specified for a breaker in its "clean" (new) condition is now permitted. This modification is also included in the corresponding test clause.

Limits of Temperature Rise

For current carrying parts in air or oil (including contacts) two values only of temperature rise are specified:

(i) For normal current ratings of 800 A or less, 40 deg C;
(ii) For normal current ratings above 800 A, 50 deg C.

The previous lower limit of 30 deg C for breakers of 200 A normal rating or less has been deleted because experience in design has shown that a temperature rise of 40 deg C is quite satisfactory and since adequate mechanical strength is safeguarded both by the mechanical duration test and by the short-time current test prescribed for breakers of all types.

When the main and isolating contacts have an adequate and durable silver facing,

a maximum temperature rise of 50 deg C is permitted for all ratings. A limit has also been introduced for other parts of the breaker in direct contact with insulation other than oil, and for this a temperature rise of 50 deg C is specified.

Construction

In the 1937 edition minimum clearance distances were prescribed for indoor and outdoor breakers. These, coupled with a power frequency voltage test of one minute's duration, indicated the insulation strength of the breaker.

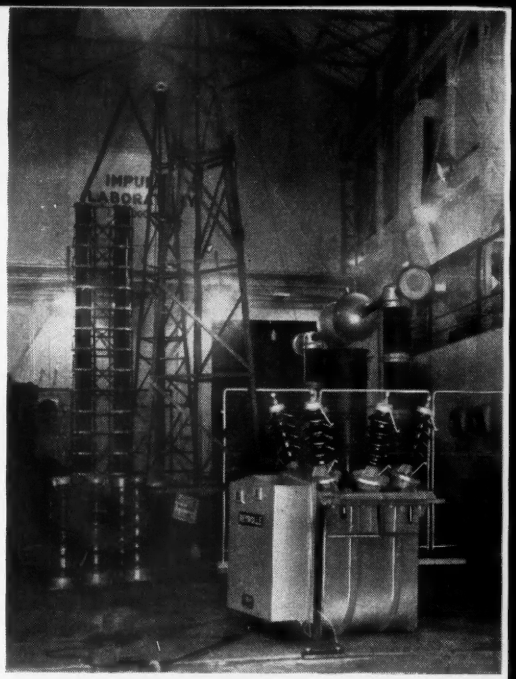
In the new edition, for outdoor breakers at 22 kV and above the insulation strength is specified in terms of an impulse level (the crest value of an impulse voltage wave) and the r.m.s. value of the one-minute power frequency voltage test. Clearance requirements have been omitted completely when such impulse levels are specified.

Apart from the two classifications of breakers and switchgear construction (namely, indoor and outdoor) when revising the Standard it was considered necessary to recognize two separate electrical conditions under which the insulation of equipment may be required to operate. These conditions are described as "electrically non-exposed" and "electrically exposed."

Outdoor switchgear is generally associated with overhead power transmission lines and is therefore subjected to external overvoltages of atmospheric origin caused by lightning discharges. External overvoltages may cause much greater stress in the insulation than will internal overvoltages due to the switching of the system. The revision therefore recognizes that, for the higher voltage range of outdoor breakers which may be subjected to external overvoltages, impulse levels are of greater significance than clearances in determining the insulation security of such apparatus, particularly since the impulse breakdown voltage of a given gap may vary considerably according to the configuration of the surfaces, or of the electrodes, between which the breakdown takes place.

For outdoor breakers for up to 11 kV impulse levels are not specified and clearance distances are therefore included.

For indoor breakers clearances are specified up to rated service voltages of 33 kV and their values remain unchanged, as compared with those in the 1937 edition. Most indoor apparatus is for voltage ratings not exceeding 33 kV, and is used in systems having cable throughout the network. In this way such apparatus is usually protected from external overvoltages.



An outdoor type circuit breaker undergoing impulse tests as now required by the revised standard specification

Internal overvoltages caused by switching operations are generally less than the insulation level of standard indoor switchgear, so impulse voltage levels for such breakers are not specified. Indoor apparatus may be connected to an overhead line either by means of a short length of cable, or through a single transformer, and thus may be subjected to external overvoltages. This risk may necessitate the use of non-standard switchgear; each case must be treated on its merits.

In the 1937 edition the next larger standard clearance was specified for breakers intended for installation at altitudes exceeding 3,300ft up to 10,000ft and two sizes larger was specified for altitudes above 10,000ft. The revised Standard specifies a gradual increase of clearance of 3½ per cent per 1,000ft in excess of 3,300ft above sea level for indoor breakers up to 33 kV and for outdoor breakers up to 11 kV.

For outdoor breakers of 22 kV and above

it is specified that the insulation level of parts in air shall be selected both by increasing the standard impulse withstand-voltage and the standard wet withstand-voltage by 3½ per cent per 1,000ft in excess of 3,300ft above sea level and by choosing a breaker designed to withstand, at sea level, voltages corresponding to these adjusted values.

In the revised Standard it is recognized that for outdoor applications it is necessary to relate the creepage distance provided on the outdoor end of an insulator with the atmospheric conditions likely to be encountered in service. Two sets of minimum creepage distances are specified, one for normally polluted and the other for heavily polluted atmospheres.

Type Tests

The most important addition to the clauses dealing with type tests is the introduction of impulse voltage tests. The reason for this interposal has been explained earlier in this article. Circuit breakers are required to stand five consecutive impulse voltage waves without flashover; should one flashover occur then the apparatus must be subjected to five further tests and only if flashover does not occur in any of the latter shall the circuit breaker be deemed to have passed the test. For breakers for systems of 110 kV and above, if they are effectively earthed* and provided with adequate surge protection, the impulse voltage test values are lower than those specified for non-effectively earthed systems.

The wet withstand power frequency test values are increased as compared with the values obtained from the formula (1,000 V plus twice rated voltage) included in B.S. 116 : 1937. Here again, however, at 110 kV and above cognizance is taken of the effectively earthed system and the wet-test values are correspondingly reduced. The values for the wet-tests specified in Table II of the new edition of the Standard will line up with the values formulated in connection with the revision of B.S. 223, entitled "Electrical Performance of High-voltage Bushing Insulators."

As mentioned previously, the revision recognizes that the inherent characteristics of some circuit breakers, such as those fitted with series trip coils or making-current releases, may be such as to warrant special consideration in respect of short circuit testing. Clauses dealing with the assessment of prospective making current and prospective breaking current are included for these types of circuit breaker.

More flexibility is allowed for short-time current tests to cover practical conditions of testing. For example, if, in order to obtain the required initial peak value, the r.m.s. value of the short-time current is increased above the value of the rated short-time current, then the duration of the test may be reduced below the rated short-time duration, provided that the product of the square of the short-time current and its duration shall be not less than the product of the square of the rated short-time current and the rated time.

Routine Tests

In addition to the usual routine operating tests for tripping and closing, other tests are now required to prove the satisfactory operation of a trip-free mechanism of a power operated breaker.

Up to and including 132 kV, the formula of 2,000 V plus 2·1/4 times rated voltage for deriving voltage values for the one-minute power frequency test has been maintained, but actual tabulated values are given in Table 12. Above 132 kV, to conform with modern design and practice, the power frequency test value is slightly reduced as compared with the previous formula. At 110 kV and above, however, the test values may be reduced for breakers intended for service on effectively earthed systems provided with adequate surge protection.

Appendices

Speaking generally, the appendices have the same form as those in B.S. 116 : 1937. They have been modified to line up with the additional material introduced into the Standard, particularly Appendix D in connection with insulation co-ordination and system earthing conditions.

It is worthy of note that operation by electrical or other power is considered essential for circuit breakers having a three-phase rated breaking capacity greater than 150 MVA, and it is recommended that special consideration should be given to power closing for breakers for rated symmetrical currents exceeding 22 kA at 3·3 kV

* A three-phase system is considered to be effectively earthed if, during phase-earth faults, the voltage to earth of the sound phases does not exceed 80 per cent of the voltage between lines of the system.

and below. These limits are in excess of those allowed in B.S. 116 : 1937.

Commentary

The breaking capacity and making capacity rating and performance of circuit breakers in accordance with this Standard still continues to be based on Chapter I of International Electrotechnical Commission publication No. 56 : 1937, entitled "Rules for Short Circuit Conditions," but it contains modifications and additions found necessary as a result of experience since the issue of both the 1937 international and the British specifications. Chapter I of the I.E.C. publication No. 56 has been brought up to date and it is anticipated that it will be published in its revised form early this year. The revised international specification contains requirements that have not at this stage been introduced into B.S. 116, but when the former is published the British Standard will be reviewed.

The revision of B.S. 116 : 1937 has taken an inordinately long time. Admittedly the war slowed down active work considerably, but even so during the revision there has been constant reconsideration and modification of clauses throughout the Standard. It is the writer's opinion that much quicker results would be obtained in revising Standards if they were sectionalized. In B.S. 116, for example, a section dealing with short circuit rating and performance of circuit breakers could be revised irrespective of the other sections. This procedure would follow that of I.E.C. publication No. 56, which is to be issued in five chapters, and it would also be in line with the American Standard for circuit breakers. The tendency at the present time is to revise a Standard *in toto* and the revision of a few clauses holds up the publication of the whole of the Standard, part of which may have been revised and may have been waiting for publication for some time.

This comparison of the new and the old editions of this important British Standard will convey but a small idea of the enormous amount of work involved in the revision, which has been achieved by the co-operative efforts of manufacturers and users of switchgear. Since standardization should follow practice, it is unavoidable that even a new Standard must be out of date in some respects by the time it is published. It is hoped, however, that B.S. 116 : 1952 will form another milestone on the road of progressive standardization of the rating and performance of oil circuit breakers and will ultimately lead to greater rationalization.

NEW BOOKS

Vacuum Technique. By Arnold L. Reimann, Ph.D., D.Sc. Pp. 449; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 50s.

It is to be hoped that not too many potential readers will be deterred by the considerable cost of this admirable work. It is, at any rate, very well printed, adequately bound, and profusely illustrated. The author assumes a reasonable knowledge of basic physical principles and then proceeds to cover the whole field of laboratory practice, with a useful amount of experimental detail. Industrial and large-scale applications are omitted, which is probably preferable to any attempt at adequate coverage without unduly enlarging the size of the work.

The first chapter is short and deals thoroughly with pumping speed, resistance of tubing, etc., which clearly can be as important as the speed and ultimate vacuum of a pump, and two short chapters describe backing pumps and molecular pumps. Two longer chapters deal with mercury and oil vapour pumps. The author distinguishes between the jet and diffusion mechanisms which may be utilized in any given pump or stage, and exposes at this point that predilection for mercury pumps and glass systems which in a later chapter he admits and refuses to apologize for.

A chapter very adequately covering most aspects of vacuum plumbing is followed by three which refer to glass systems and comprise a comprehensive collection of data on the physical properties of glasses and metals for seals and lead-throughs, together with the theory and techniques of glass-working, copper-glass seals and a comprehensive range of matched-expansion seals.

In this chapter, as elsewhere, the numerous illustrations leave nothing to be desired for completeness and clarity.

The final chapters are on the absorption of residual gases in sealed-off systems, manometers and methods of pressure measurement. There are some useful tables of pump data, glasses, etc., and each chapter has a bibliography. The index is particularly well arranged.—P.L.D.

Modern Electric Lamps. By D. A. Clarke. Pp. 205 plus ix; figs. 146; index. Blackie & Son, Ltd., 66, Chandos Place, W.C.2. Price 20s.

This book is one of a series, each volume of which deals with a particular branch of electrical engineering, and the author is to be congratulated on the way in which he has covered in considerable detail the subject indicated by the title. He has obviously gone to great pains to secure authentic and up-to-date information, with the result that not only the general electrical engineer, but also the specialist in lighting matters, will find the book a most valuable guide and compendium. After an introductory chapter on radiation, the author takes in turn the metal filament lamp, the various types of discharge lamps and, finally, special lamps such as electronic flash. He gives in each case a wealth of constructional detail as well as much information on operating characteristics, circuits, details of light output and other relevant information.

The least successful chapters are the last two which deal respectively with illumination and photometry and with colour. The former, especially, contains a number of statements which are misleading and several which are incorrect and it should be very carefully revised in any future edition. The chapter on colour, too, could be considerably improved. This is, however, a book on electric lamps and as such it is deserving of high praise and can be most strongly recommended.—J.W.T.W.

Men and Discoveries in Electricity. By Bryan Morgan, B.A. Pp. 188; plates 12; figs. and index. John Murray, Albemarle Street, London, W.1. Price 8s 6d.

This readable and informative book is a popular history of electricity from the epoch of Thales (640–546 B.C.), who discovered the attractive power of lodestone and amber, to the present day. Intended primarily for readers without scientific training, it can, however, be recommended to those of specialized attainments as a reference source of significant electrical developments in seven time stages, which are set against a background of philosophic opinions current from age to age.

The names of ninety-five scientists and inventors are conveniently tabulated in chronological order with their nationalities and chief electrical contributions, further particulars of which can be found in the text by consulting the two-part index, viz. technical and general. In the table Edison is credited with the invention of the incandescent lamp and Swan with industrial improvements; in our view the attributions should be reversed.

The general approach to the more modern aspects is by concentrating on the work of three men and touching more briefly upon the achievements of others in between. The three men chosen are Faraday and J. J. Thomson, with whom theory and experiment went hand in hand, and Baird, the lone television inventor whose results were so quickly superseded by those of scientific teams with greater perception of the possibilities of electronics. The interest of the plates would have been enhanced had they been inserted near the subjects to which they relate instead of being brought together in the centre of the book.—C.O.B.

Books Received

The Gantt Chart. Wallace Clark. Third Edition. Pp. 168; figs. 55; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 12s 6d.

"Mechanical World" Electrical Pocket Book. Pp. 360. Emmott & Co., 21, Bedford Street, London, W.C.2. Price 3s.

Engineering Electronics. By W. G. Dow. Second edition. Pp. 627; figs. and index. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 68s.

Electronic Measurements. By F. E. Terman and J. M. Pettit. Pp. 707; figs. and index. McGraw-Hill Publishing Co., Ltd., 95, Farringdon Street, London, E.C.4. Price 72s 6d.

High Voltage A.C. Circuit-Breakers. By S. Gerszonowicz. Pp. 454; figs. 299; bibliography and index. Constable & Co., Ltd., 12, Orange Street, London, W.C.2. Price 63s.

United States Patent Law

New Provisions in the 1953 Act

By S. T. MADELEY

MUCH has been done in the way of patent legislation in the United States of America since George Washington approved the early Act of 1793. In those days, and indeed until 1843, a patentee in the U.S.A. was not required to make public a written description of his invention; in fact this was kept secret. All one can go by, therefore, is the title. An early patent, issued to Thos. Brown on 20th December, 1816, was for improvements in the construction of electrical apparatus. It was apparently the only one issued in that year. In the year 1951 electrical patents granted by the U.S. Patent Office amounted to nearly a thousand.

The Patent Act that George Washington approved was quite a short document. The 1953 Patent Act (Public Law 593) contains 293 sections, the first 99 of which deal more or less with the domestic affairs of the Patent Office, and therefore need not concern us here.

Widening of Scope

When we reach Section 112 we come to an interesting provision, for the section says:—

> "An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof."

A considerable widening of the ambit of claims would now appear to be possible. It remains to be seen how this will affect inventions directed towards a new use of a known process, machine, manufacture, composition of matter or material, which is allowable, under Section 100, for patenting.

Let us now put down *in extenso* Section 102, which deals with the conditions of patentability, novelty and loss of patent right:—

> "A person shall be entitled to a patent unless—(*a*) the invention was known or used by others in this country, or printed or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent, or (*b*) the invention was patented or described in a printed publication in this or a foreign country or in public use or sale in this country more than one year prior to the date of the application for patent in the United States, or (*c*) he has abandoned the invention, or (*d*) the invention was first patented or caused to be patented by the applicant or his legal representative or assigns in a foreign country prior to the date of the application for patent in this country on an application filed more than twelve months before the filing of the application in the United States, or (*e*) the application was described in a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, or (*f*) he did not himself invent the subject matter sought to be patented, or (*g*) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other."

It would appear from (*d*) that in such cases it will be allowable to have the relevant foreign patent issued at once after the filing of the U.S. application. But this only affects applications filed after 1st January, 1953.

Differences in Subject Matter

Section 103 says that differences between the subject matter sought to be patented and the prior art are not patentable if the "subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." So there is still room and to spare for strenuous battles about subject matter.

Before this Act errors, whether unintentional or not, made by wrongly joining or omitting an inventor from a patent application, could not be corrected. Now, under Section 116, correction may be made if the

error was without any deceptive intent. Under Section 116 if an inventor refuses to join in an application with a co-inventor or cannot be found or reached after diligent effort the co-inventor may apply on behalf of himself and the omitted inventor. Section 118 deals with similar circumstances in the case of an inventor who refuses to execute an application for a patent where a person is concerned who is an assignee or one to whom the inventor has agreed in writing to assign the invention. Section 256 deals with errors in statements of joint inventorship by inclusion or omission in the cases of granted patents.

Section 119 requires the filing of priority documents in the cases of applications emanating from abroad, as for example the United Kingdom, where priority of the basic foreign filing date is claimed, the United States case having been filed within the priority year.

Under Section 121 divisional applications in cases filed in the ordinary way are to take the date of the filing of the original case and " shall not be used as a reference either in the Patent Office or in the courts against a divisional application or against the original application or any patent issued on either of them, if the divisional patent is filed before the issuance of the patent on the other application. . . ."

Section 255 enables errors to be corrected which were not the fault of the Patent Office, provided they are of a clerical or typographical nature, or of minor character.

Section 262 provides that in the case of joint ownership " each of the joint owners of a patent may make, use, or sell the patented invention without the consent of and without accounting to the other owners."

Infringement of Patents

Section 271 deals with the infringement of a patent and contributory infringement of a patent. Subsection (*b*) states that whoever actively induces infringement of the patent shall be liable as an infringer and subsection (*c*) extends the net to contributory infringers in the cases of those who " sell a component of a patented machine, manufacture, combination or composition, or a material or apparatus for use in practising a patented process, constituting a material part of the invention knowing the same to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial non-infringing use."

According to Section 282 a patent is to be presumed valid and the burden of establishing invalidity thereof shall rest on a party asserting it. The defences set out in the same section are (1) non-infringement, absence of liability for infringement, or non-enforceability; (2) invalidity of the patent or any claim in suit on the basis of any of the sections dealing with patentability and grant of patent; (3) invalidity of the patent or any claim in suit for failure to comply with any requirements of Section 112 or Section 251 (which deals with the reissue of defective patents); (4) any other fact or act made a defence.

Amount of Damages

According to Section 284 damages, where granted, are not to amount to less than a reasonable royalty plus interest and costs, and the damages may be increased by the court up to three times the original amount. Section 286 places a time limit of six years on a claim for damages. Section 287 limits the damages in the case where goods are not marked or labelled " Pat " or " Patent " together with the number of the patent on themselves or their package. Invalid claims must be disclaimed according to Section 288 before commencing a suit for infringement or no costs will be granted to the patentee.

For some time the American courts have looked askance at British provisional specifications as bases for claiming priority in " convention " cases. Now we get a downright judgment by the Court of Customs and Patent Appeals, that British provisionals will not be acceptable as bases for priority dates unless they are drawn as carefully as American specifications and illustrated with drawings where practicable. This was delivered in the case of the U.S. patent application in the name of Smyth corresponding to the British 1939 application made by Kolster Brandes, Ltd., and C. N. Smyth for television receivers. It should be remembered that a U.S. patent is not void for previous use or knowledge of the invention in a foreign country.

The above is the very briefest summary of the new Act and must of course be subject to the imperfections of all such summaries. Those interested will naturally turn to the Act itself for fuller information.

Engineering in Europe

Survey of Current Literature

A SYNOPSIS of the problem of line surges, their effects on power systems and installations and the theoretical means of investigating them introduces the detailed consideration of indirect (preventive) and direct surge protection. The co-ordination of surge divertors with protection levels and the resulting safety factors are then discussed and a theoretical treatment of the operation of two types of modern divertors (17·5 and 210 kV) under internal and external surges follows. Equivalent circuits illustrate the phenomena described wherever possible, as well as oscillograms taken from contemporary literature on the subject.

The second author deals in a more general way with the conditions to be satisfied by surge protections, their efficiency characteristics, commercial frequency and impulse breakdown voltages, residual voltage and discharge power and the interrelations of these characteristics. The harmlessness of a divertor to its surroundings, i.e., its non-contribution to current surges (e.g., due to short-circuits) and its non-interference with other protections (e.g., rapid-reclosing installations) is another interesting point discussed. The final sections deal with divertor testing and assessment of its efficacy in relation to the existing French regulations.—" The Present State of the Problem of H.V. Surge Divertors," S. Teszner and C. Ledoux, *Bulletin Soc. Franc. des Electriciens*, 7th series, Vol. 2, No. 22, pp. 555–573, October, 1952, in French.

Cable Fault Analysis

This analysis was based on reports from the supply industry and embraced 38 power systems with an aggregate length of 30,000 km of cable lines. The results of the analysis indicate that 50 per cent of all cases of short circuits to earth occur during normal operation at points where the insulation has deteriorated. Repeated punctures of the insulation and flashovers occur mostly (in systems with isolated neutral, in 83 per cent of all cases) at points of reduced dielectric strength of the insulation.

The method of neutral-earthing has hardly any influence on the percentage of single-phase earth faults turning into interphase faults at another point of the line, because here again the secondary discharges at weak points of the insulation are really decisive for the kind of fault developing eventually. Nor was any influence of the magnitude of the capacitive earth-fault currents on the percentage of earth faults turning into interphase faults noticed in systems with directly earthed neutral. The voltage surges produced by single-phase faults to earth lead only rarely to interphase faults at other points (in 39 per cent of all cases in systems with isolated neutral) and this proves that their ratios cannot be high. Where the cable insulation is intact, single-phase earth faults can never produce interphase faults at other points of the system.—" Analysis of Damage by Earth Faults on Cable Systems," N. N. Belyakov, *Elektricheskie Stantsii*, No. 6, pp. 40–43, 1952, in Russian.

Power Line Diagram

A diagram suggested by the author is a universal performance type for a long line which renders it unnecessary to re-plot the diagram in every single special case, as is required for the classical types (e.g., Evans and Sell's) and also saves the laborious intermediate calculations required for the use of general diagrams previously suggested. The diagram is based on the transformation of the impedance equation by Jackson and Huxley's method and uses the well-known representation of tanh as a family of circles in Cartesian co-ordinates. The index of the circles indicates active resistances (in terms of reduced impedances) and the abscissæ reduced reactances. The phase angles can also be conveniently read. An analogous impedance diagram for sinh and cosh is also possible (sinh and cosh obviously represented by hyperbolas). These simple

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates. —Editors, *Electrical Review*.

diagrams show the value of the method, yet even with their use intermediate calculations are still required. The latter are avoided by plotting a logarithmic sinh and cosh diagram which is the universal diagram referred to. Its use is explained with reference to several examples. The diagrams may also be used for communications problems.—" Diagrams for the Calculation of Transmission Lines," J. Ben-uri, *E. und M.*, Vol. 69, No. 19, pp. 439-444, 1st October, 1952, in German.

Use and Abuse of Fuels

FOR the purpose of his lecture to the Royal Society of Arts on 14th January, Mr. W. E. P. Johnson, of Power Jets (Research & Development), Ltd., defined fuel as a substance which reacts with others to release energy. All fuels, he pointed out, were derived from the sun. Mineral fuels were stored energy and so represented capital, as distinct from water and wind which could be regarded as revenue. The reserves of easily accessible coal were probably known, but the process of getting it was expensive, so the aim should be to replace it as far as possible by revenue resources.

After considering the thermal performances of heat engines, in terms of their inefficiencies, the lecturer expressed his conviction that gas turbines, designed appropriately for particular duties, could easily surpass any existing machines, about 50 per cent inefficiency being an early possibility. The engineering problem was to extract as much useful energy out of the fuel as the heat cycle permitted and to put the remainder to some useful purpose. With gas turbines a great proportion of the heat rejected (which accounted for nearly all inefficiency) was at a saleable temperature, say, 250 deg C, but varying widely with design, whereas to ensure minimum inefficiency with steam turbines the temperature must be little above that of the atmosphere. Moreover, the gas turbine could run on a greater range of fuels than any other and it would be very widely used in industry on account of its many other merits.

In domestic or institutional premises waste occurred through loss of heat to the atmosphere, the heating of several objects in order to heat one usefully and loss by radiation. In industry there were exothermic losses from the use of electricity to drive auxiliary plant associated with processes evolving heat energy derived from the reaction of fuels, examples of which were blast furnaces, open-hearth and Bessemer steel making and nitric acid manufacture. Very little had yet been done towards making such processes self-driving. In the United Kingdom at least a million tons of coal was used each year in drying textiles during their processing, although half could be saved by the adoption of the " pressure still " cycle, in which the latent heat of vaporization was recovered instead of expelled with the water vapour as it dried off.

Coal was essential for many purposes, but not for the mere liberation of energy. The overall national cost of using fuel oil would be far less, although the effective cost difference between it and coal was about 1·5 to 1. Estimates of probable world resources of oil were very conservative and coal consumption should not be increased to avoid the use of oil.

References were made to other forms of fuel, including peat, natural gas, and dilute methane from upcast ventilation air of coal mines. Potentialities were: the exploitation of solar energy to synthesize fuels, photochemically or photobiochemically, more quickly than nature did it; hydrogen peroxide, ethyl alcohol and liquid oxygen, which propelled the V2 rocket; pure oxygen; the use of nuclear energy to procure carbon from chalk for combination with oxygen; and chemically produced highly concentrated non-explosive fuels from cheap materials.

Mr. Johnson said that it would be necessary to spend to save. To use fuel was easy; to avoid abusing it was both imperative and costly.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Ministry of Supply has announced that **Mr. A. G. E. Briggs,** who relinquished the post of Deputy Controller of Supplies (Munitions Production) on 1st January, has consented to remain on the Royal Ordnance Factories Board of Management as an additional non-official member. He has served on the Board since it was formed in April, 1952. Mr. Briggs, who was created a knight in the New Year Honours List, is joint assistant managing director of the Electrical Division of Tube Investments, Ltd., and resumed his duties with the company on relinquishing his post with the Ministry of Supply.

Mr. C. A. Carr, Associate I.E.E., has resigned his position as principal assistant (purchasing) with the South Eastern Electricity Board to become technical representative and agent for the South of England for the E.M.P. Electric Co., Ltd., Garman Road, Tottenham, N.17. Mr. Carr, whose address is La Rocque, Cranleigh Avenue, Rottingdean, Sussex (telephone, Rottingdean 2184), was for seventeen years in the engineering and purchasing department at the head office of the County of London group, before joining the headquarters staff of "Seeboard" on vesting day. Previously he had held appointments with I.C.I., Ltd., Billingham-on-Tees, A. Reyrolle & Co., Ltd., and the Sunderland Forge & Engineering Co., Ltd.

Mr. William S. Bulpitt, one of the senior directors of Bulpitt & Sons, Ltd., recently completed fifty years' service with the company. A dinner was given by the directors on 13th January at the Grand Hotel, Birmingham, to 300 long-service employees and staff to commemorate the event. Mr. Walter H. Bulpitt, O.B.E., J.P. (fifty-nine years' service), sat with Mr. Albert E. N. Bulpitt (fifty-seven years' service) and thirty-two members of the family at the top table. Mr. F. W. Bulpitt presented Mr. W. S. Bulpitt with a gold watch, and Mr. J. T. Bradford, senior foreman, presented him with a grandmother clock on behalf of the employees and staff. Eight members of the works and staff received gold watches for the completion of twenty-five years' service.

Mr. W. S. Bulpitt

Major E. C. Peckham, chairman and managing director of Metalock (Britain), Ltd., is going to South Africa this month to complete arrangements for the formation of a new Metalock company in that country.

The Metropolitan-Vickers Electrical Co., Ltd., announces that **Professor Willis Jackson,** D.Sc., D.Phil., M.I.E.E., has accepted the full-time appointment of director of research and education of the company as from 1st July next. The appointment carries with it a seat on the board of the company. Professor Jackson is Professor of Electrical Engineering at the Imperial College of Science and Technology of the University of London. The present director of research and education, who succeeded Sir Arthur P. M. Fleming in that position, is **Dr. C. Dannatt.** Professor Jackson's appointment will release Dr. Dannatt for an extension of his present duties as assistant managing director.

Prof. Willis Jackson

Mr. C. H. de Nordwall, M.I.E.E., has been appointed manager for South America of the Metropolitan-Vickers Electrical Export Co., Ltd. Mr. de Nordwall received his technical education at Faraday House and went to Metropolitan-Vickers as a college apprentice in 1922. After a period in Nigeria as chief engineer of Northern Nigeria (Bauchi) Tin Mines, Ltd., he went to Russia in 1930 with the M-V erection staff, and three years later he transferred to the company's London office. In 1938 he joined the British Electrical Development Association as power development engineer. From 1939 to 1945 he served in various parts of Europe with the Royal Engineers, attaining the rank of colonel. Afterwards he was director, Electrical Industries Branch, in the Control Commission, Germany. In 1947 he returned to Metropolitan-Vickers, joining the sales

management staff, and in the following January he was appointed sales manager, Industrial Control Department. Mr. de Nordwall was chairman of the M-V Overseas Association for 1950-51.

Mr. G. D. Harradine, Associate I.E.E., succeeds Mr. de Nordwall as sales manager of the Industrial Control Department. He

Mr. C. H. de Nordwall

Mr. G. D. Harradine

joined the company as a draughtsman in the Industrial Control Department in 1927, was transferred to the sales side a year later, and became section leader, tenders, in 1933. In 1947 he was appointed chief correspondent, and in 1949 assistant to the sales manager. He has been assistant sales manager, Industrial Control Department, since August, 1951. Mr. Harradine is a member of the Association of Mining Electrical and Mechanical Engineers.

Mr. R. D. V. Roberts, B.Com., has been appointed deputy director of welfare of the British Electricity Authority but will, at the same time, continue his present duties as secretary of the National Joint Advisory Council. Before entering the Authority's service, Mr. Roberts was deputy chief district officer to the Miners' Welfare Commission, and previously district miners' welfare officer in the Northumberland and Cumberland coalfields.

Mr. P. F. Deakin and **Mr. F. W. Main** have retired from the board of Enfield Cables, Ltd. Mr. Deakin was the company's works director from 1943 until 1951, when he had to retire from active work owing to ill-health, but remained on the board as a part-time member.

Mr. G. Leslie Wates, J.P., chairman of Johnson & Phillips, Ltd., has been made a Companion of the Institution of Electrical Engineers.

Mr. E. L. Cadwallader has relinquished his executive appointment as a general manager of C.A.V., Ltd., on reaching the age of seventy, but retains his seat on the board in the capacity of consulting director. **Mr. Hubert G. Mason,** now appointed joint general manager, is director of sales and service and is also a member of the board of Joseph Lucas (Export), Ltd. He has been with the C.A.V. organization for twenty-six years and was appointed to the board in 1945. He will continue to control the sale and service activities of the company.

Mr. W. Revell took over the duties of London sales manager of Aerialite, Ltd., on 13th January, and will be operating from their London depot at 20/22, Craven Road, Paddington. **Mr. L. G. Harrison** will be looking after the company's Scottish interests from the depot to be opened in Glasgow.

Owing to ill-health, **Mr. W. S. Knight,** managing director of Lightalloys, Ltd., has been granted six months' leave of absence by the board, and **Mr. K. C. T. Marshall,** works director, has been appointed acting managing director. **Lord Rockley** has resigned from the board owing to pressure of his other commitments.

Mr. A. A. Gray, C.A., principal assistant (internal audit) in the Chief Accountant's Department of the South West Scotland Electricity Board, has been appointed accountant in the Dumfries and Galloway Sub-Area of the Board.

Mr. A. L. Patterson, chief engineer of the Shawinigan Engineering Co., Ltd., Montreal, has been appointed vice-president of the company, and is being succeeded as chief engineer by **Mr. G. Rinfret,** supervising engineer. Both men have been with the company since it was organized in 1919 as a subsidiary of the Shawinigan Water & Power Company.

Mr. A. B. Race, M.I.E.E., who, as already announced, retired from the managership of the B.T.H. Manchester district office on 31st December, had been with the company for over forty years, the last twenty-two as manager of the Manchester district office. Mr. Race received his early technical education at Durham University (Armstrong College), and served an apprenticeship with Clarke, Chapman & Co., subsequently obtaining further practical experience with that company, and with A. Reyrolle & Co., Ltd.

Mr. A. B. Race

In 1912, he joined the B.T.H. Construction Department, becoming superintendent for the London district, and then, from 1916 until 1930, obtained experience in the commercial engineering departments at the head office, Rugby. In 1928 he became assistant to the manager of the Supply Department, Rugby, and in 1930 was appointed manager, Manchester district office. From 1933 to 1952, Mr.

Race was also the manager of the B.T.H. Liverpool district office.

On the occasion of a farewell luncheon at the Manchester Engineers' Club, Mr. Race was the recipient of a gift from his staff at the Manchester and Liverpool district lamp depots in the form of a portable typewriter, a "Wolf" home constructors' set, and a cheque. The presentation was made by Mr. S. Birchall, the longest serving member of the Manchester office staff, supported by Mr. Darlington, the longest serving member of the Liverpool office lamp department staff.

Mr. P. Briggs, M.Inst.F., chief generation engineer (operation) South Eastern Division, British Electricity Authority, has been appointed controller of the Merseyside and North Wales Division. He succeeds **Mr. W. A. Gallon,** B.Sc., M.I.E.E., who was recently appointed deputy chairman of the South Wales Electricity Board.

Mr. Briggs received his engineering training in the workshop, drawing office and test department of Peter Brotherhood at Peterborough. From 1925 to 1929 he held the post of charge engineer at Islington power station and then went to the old Fulham power station in the same capacity. Successively he was promoted to assistant operating engineer, maintenance superintendent in the new Fulham station, and then power station superintendent. When the electricity supply industry was reorganized in 1948 he became responsible for the control and operation of all the stations in the South Eastern Division.

Dr. Thomas E. Allibone, F.R.S., has been appointed to the board of the Edison Swan Electric Co., Ltd., in the capacity of director of research. Dr. Allibone retains his position as director of the A.E.I. research laboratory, Aldermaston.

Mr. F. Winstanley, the director of the General Electric Co., Ltd., responsible for the illuminating engineering, lighting fittings and household electrical appliance sales organization, is leaving to-day (Friday) for a business tour of the company's branches in New Zealand, Australia and Tasmania. He will be away for about four months.

The Electrical Power Engineering Co. (Birmingham), Ltd., announces that consequent upon the decision of **Mr. A. N. D. Kerr** to return to the field of standard industriai a.c. motors, it has appointed **Mr. W. A. Biggs,** A.M.I.E.E., as its London manager. Mr. Biggs served his apprenticeship at the Witton Works of the General Electric Co., Ltd., and has subsequently had a wide experience in sales and service of both motors and control gear. During the war he served in the Royal Navy, becoming electrical officer in H.M.S. *Nelson*.

Some 130 members and guests obviously enjoyed to the full the dinner-dance of the **I.E.E. Utilization Section** in London on 13th January. Good fellowship, a well-filled dancing floor at all appropriate times and a pleasing interlude, when Mr. J. Vaughan-Harries once again proved himself a past-master of story telling, were the order of this essentially social occasion, rather than speech making. The chairman of the Section, Dr. J. W. T. Walsh, O.B.E., M.A., in his remarks of welcome, referred to the present as the beginning of a second Elizabethan period, during which electrical engineers had a major part to play. Col. B. H. Leeson, O.B.E., T.D., President of the Institution, commented on the spectacular growth in the numbers of electrical engineers and their work during the post-war years.

The annual dinner of the **Wholesale Fittings Co., Ltd.,** was held at the Tavistock Restaurant, Charing Cross Road, London, W.C.2, on 10th January. Speeches were made by Mr. J. Altman (chairman), Mr. F. Barnett (managing director) and Mr. D. Rose (director). In addition to the London head office staff many members of the London and provincial branches were present. The dinner was followed by a dance.

The annual party for children of Aldermaston employees of the **Sterling Cable Co., Ltd.,** was held on 10th January. Mr. J. S. Clark, chairman and managing director, acted as host to 238 children, who were entertained with conjuring, games, tea and a film show, the party ending with the entrance of Father Christmas who distributed presents to each of the young guests.

On each evening last week the **Ekco Players** (E. K. Cole, Ltd.) presented a pantomime, "The Tinder Box," at the Ekco Works theatre, Southend-on-Sea. The pantomime was written and produced by Freddie Bowles, and the Ekco theatre orchestra provided the music under the direction of Mr. R. K. Spencer, assistant chief engineer. There was a full house at each performance.

The inaugural meeting of **McKechnie Brothers, Ltd.,** Birmingham Works "25 Club" took place at the White Horse Hotel, Congreve Street, Birmingham, on 9th January. The first president, Mr. J. Rae, a director of the company, who joined the firm over fifty-four years ago, received the members and guests, and later made presentations of watches or clocks to seventeen employees who have completed twenty-five years with the company and who become members of the Club, which now has a membership of 188. Mr. H. Hollingworth, the first vice-president of the Club (forty-three years' service), assisted the president. The Widnes Works of the company has had its "25 Club" since 1949.

The company held the first of its annual parties for its employees' children on 17th January. Because of the large numbers, two separate parties are being given, and the

second will be on 7th February. The first was for 220 younger children from five to eight years, and included tea and an entertainment in the works canteen. The second party is being given to 210 of the older children. Motor coaches will take them from the company's works to see "Mother Goose," at the Aston Hippodrome, after which they will be entertained to a children's party tea at the works canteen.

The annual New Year party and ball of **Marconi Instruments Social and Sports Club** was held in Watford Town Hall on 9th January. Some 750 members and friends attended, and in addition to dancing, numerous games and competitions added to the gaiety of the evening. Guests from Marconi's Wireless Telegraph Social and Sports Club were welcomed by Mr. W. G. Allen, chairman of the Club, as were representatives of Sanders Electronics Mr. J. M. Furnival, general manager of the company, congratulated the Club on its efforts.

The annual sports of the **Indian Cable Co., Ltd.**, were held on 4th January on the factory recreation ground at Tatanagar, Bihar, India. The finals of 25 track and field events took place in brilliant sunshine and were watched by thousands of spectators. The departmental trophy was won by the Engineering Department and the special trophy presented by British Electric Stores was won by R. M. Thampi. After tea had been served the prizes and trophies were presented to the winners by Mrs. D. J. F. McIntosh.

So great was the number of invitations accepted for the annual children's party of the **Johnson & Phillips Social Club** that it had to be given in two stages this year, no fewer than 400 children being present on each evening. The entertainment included a sing-song, a two-hour show by members of Dewrance & Co.'s Social Club and finally a visit from Father Christmas.

The annual staff dinner of **F. Westerman (Wholesale), Ltd.**, was held on 3rd January at the Grand Hotel, Birmingham. Mr. F. Westerman thanked the staff for their co-operation. Mr. F. S. Bowles, general manager, proposed the toast to the company. Mr. H. E. Bagnall, the company's secretary, proposed the health of the guests, and Mr. H. Adey, Birmingham branch manager, Edison Swan Electric Co., Ltd., and Mr. H. E. Gibson, chief commercial officer, Midland Electricity Board, replied.

At the annual dinner of **Astral Switchgear, Ltd.**, the opportunity was taken by Mr. E. T. White, chairman of the company and also of the Ashley group of companies, of which Astral Switchgear, Ltd., is a member, to present to Mr. F. Moore a Westminster chime clock to commemorate twenty-five years' service with the company.

OBITUARY

Mr. James Whitcher, M.I.E.E., of Messrs. Kennedy & Donkin, consulting engineers, died on 12th January at the age of eighty-three. He joined the staff in 1919, coming from the Switchgear Research Department of the British Thomson-Houston Co., Ltd., and was the firm's senior electrical engineer, being engaged principally in research and design until his retirement from active business in 1947, when he was appointed a consultant. His work was mainly concerned with problems needing a scientific approach, particularly where new technical developments had to be applied, such as the development of switchgear for increasing rupturing capacity, the excitation and stability of turbo-alternators, the performance of electric transmission lines and the investigation of line and transformer faults. The influence of his work is seen in the interconnection of power stations in the London area, ownership of which was ultimately merged in the London Power Co.

In his early years Mr. Whitcher was much concerned with the electrification of the South Eastern section of the Southern Railway and after that with the design of substations and transmission lines for the Central Electricity Board.

Mr. H. Leslie Dixon, M.I.E.E., died on 12th January in his eightieth year. In his early days he served with the Corporation of London and was chief of the generating station at Leatherhead. In 1919, after the first world war, in which he served as captain in the R.F.C. and R.A.F., he founded Leslie Dixon & Co., dealers in Government surplus electrical and radio apparatus.

The late Mr. H. L. Dixon

Mr. William James Watters, who was district electrical engineer with the East Indian Railway for many years until his retirement in 1937, died on 14th January at Wimbledon.

Mr. J. Morton, chief engineer of the West Midlands Joint Electricity Authority until his retirement in 1942, died on 14th January. Mr. Morton commenced his career with the Cunard Steamship Co. in 1900 and in 1905 joined C. A. Parsons & Co., and for eighteen months was in their steam turbine testing department. After a short period with the Lancashire Electric Power Co., he joined the British Thomson-Houston Co., Ltd., for whom he took charge of the erection of the vertical turbo-alternator sets at Ring Road, Leeds, for the supply of energy to the Leeds Corporation

tramways substations. He was appointed mains and permanent way superintendent with the Paisley & District Tramways Co. in 1907, but returned to the B.T.H. Co. in 1911, and went to Malta to take charge of the installation of the plant in connection with the radio station installed by that company for the Admiralty. On returning to Rugby he became chief assistant of the Construction Department. Mr. Morton joined the Birmingham Corporation Electricity Department in 1918, and was appointed transmission assistant with the West Midlands J.E.A. in 1927, later becoming chief assistant engineer and (in 1938) chief engineer.

Dr. Hans Carsten.—The death occurred recently of Dr. Hans Carsten, Dr.Eng., M.I.E.E., F.Inst.P., who had been consultant telecommunications engineer with British Insulated Callender's Cables, Ltd., for eleven years. Dr. Carsten was a first-class mathematician and physicist and was widely known in international circles for his work on telecommunications and cable measurement techniques. He received his technical training at Danzig University. After a short period in the telegraph research station of the German Post Office he joined the Central Laboratory of Siemens & Halske in 1922 and eight years later was transferred to the Transmission Cables Sales Department. He left Germany before the war and joined B.I.C.C. in 1941.

Mr. H. Sayce, chief lamp salesman at the Birmingham office of the British Thomson-Houston Co., Ltd., died recently at the age of fifty-eight. Mr. Sayce had been with the company since 1933.

Mr. C. J. Page.—The death has occurred at the age of sixty-seven of Mr. C. J. Page, principal of the firm of Page & Stibbs, electrical contractors, and a past-president of the Cardiff Chamber of Trade. Mr. Page was also a deputy chairman of Cardiff City Association Football Club and a member of the Council of the Football Association of Wales.

WILLS

Sir Archibald McKinstry, a former managing director and deputy chairman of Babcock & Wilcox, Ltd., and a former chairman of the Metropolitan-Vickers Electrical Export Co., Ltd., who died on 6th October, left £74,159 gross (£73,640 net).

Mr. J. F. Urquhart, deputy manager, South Caledonia Area, North of Scotland Hydro-Electric Board, who died on 16th August, left personal estate in England and Scotland valued at £4,100.

Mr. W. R. Elliott, A.M.I.E.E., formerly engineer and manager of the East Ham Corporation Electricity Department and late secretary of the British Electrical and Allied Industries Research Association, who died on 16th October, left £7,423 gross (£7,091 net).

Mr. S. W. Melsom, M.I.E.E., former technical officer to the Cable Makers' Association, who died on 15th November last, left £2,296 gross (£2,236 net).

Mr. G. F. D. Campbell, chairman and managing director of Campbell & Isherwood, Ltd., who died on 1st October, left estate " so far as can at present be ascertained " valued at £29,028 gross (£28,895 net).

Packaging Exhibition

SINCE it is estimated that packaging represents on an average about one-tenth of the total cost of any product, the Packaging Exhibition, which until next Friday is being held at Olympia, London, has a particularly wide appeal. From the electrical point of view it is of interest not only for the various methods demonstrated for packaging electrical goods, but also for the application of electricity to the operation of the equipment used.

Apart from corrugated and laminated fibre-boards, materials used for modern packaging include metallic foils, jute, wood, wool (loose or in rope or pads), pulp preformed to fit the article to be packed, and a growing range of plastic materials among which are transparent types and some for spraying on.

Among the wide range of electrically operated apparatus shown are automatic or semi-automatic machines for weighing, filling, packing, bagging, tableting, capping, wrapping, label printing, heat sealing, stringing, taping and wire stitching. Items of special interest include what is claimed to be the first British thermo-plastic labeller, shown by Rawsons (Labelling Machines), Ltd., prototypes of new labelling and sealing machines (Samuel Jones & Co., Ltd.), a self-feeding gumming machine (J. Trapow & Co., Ltd.), high-speed bulk packaging machines (Bracknell, Munro & Rogers, Ltd.), and a flour-packing installation complete with weigher, elevator and dust extraction plant (Arenco).

Electronic devices are being increasingly employed for controlling the operation of the equipment. A comprehensive demonstration of the use of such devices is to be seen on the stand of Walter Ward (High Wycombe), Ltd., on such appliances as packers and weighers, counters, level controllers, discriminators and metal detectors. The 1953 version of the Cinema-Television electronic metal detector is demonstrated for the first time on a motorized conveyor fitted with a " Cintel " automatic rejection unit. Recent developments in metal detection by Goring Kerr have resulted in the manufacture of a single-sided search head which can be simply suspended over the conveyor, thus obviating the necessity for braeking the belt for installation or removal.

GENERATION IN 1952

Plant and Output Statistics

DECEMBER'S figures for electricity generated showed a substantial increase, the total at 6,563 million kWh being 13·9 per cent higher than that for the corresponding month of 1951 (5,762 million kWh), which represented the highest percentage rise of the year.

During 1952 the British Electricity Authority, the North of Scotland Hydro-Electric Board and the Lochaber Power Co. generated 62,393 million kWh, compared with 59,971 million kWh in 1951. This increase of 4 per cent was secured with an added coal consumption of 0·9 per cent (294,000 tons) but a reduced oil consumption of 19·6 per cent (16,500 tons).

Table I reveals an increase of 573 MW in the installed generation capacity since the figure for 30th November was published, the total at 31st December amounting to 17,823 MW. New plant installed in December in B.E.A. power stations included the following:—Bankside: 60 MW B.T.H. set. Battersea: 425,000 lb/hr Babcock & Wilcox boiler. Brunswick Wharf: 52·5 MW Metrovick set and two 320,000 lb/hr Clarke, Chapman boilers. Brighton: 52·5 MW Richardsons, Westgarth set and two 320,000 lb/hr B. & W. boilers. Uskmouth: 60 MW G.E.C. set and 360,000 lb/hr B. & W. boiler. North Tees: 60 MW C. A. Parsons set and 360,000 lb/hr B. & W. boiler. Littlebrook: 60 MW C. A. Parsons set and two 360,000 lb/hr International Combustion boilers. Plymouth: 31·5 MW

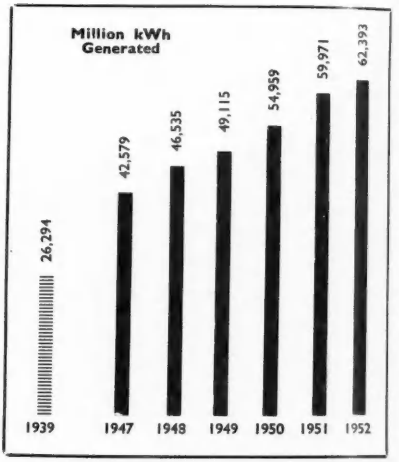


TABLE I—ELECTRICITY GENERATED AND PLANT INSTALLED

	Fuel consumed Thousand tons		kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Oil	Steam	Water power	Total*		
British Electricity Authority ..	3,622	5·1	6,330	42	6,386	6,020	17,180
North of Scotland	38	1·4	53	119	177	175	643
Total for December, 1952	3,660	6·5	6,383	161	6,563	6,195	17,823
Corresponding total for December, 1951	3,175	6·8	5,505	242	5,762	5,445	16,328
Increase or decrease as a percentage of 1951	+15·3	−4·4	+16·0	−33·5	+13·9	+13·8	+9·2
Total for 1952	34,485	67·5	60,563	1,672	62,393	58,802	
Total for 1951	34,191	84·0	58,259	1,540	59,971	56,588	
Increase or decrease as a percentage of 1951	+0·9	−19·6	+4·0	+8·6	+4·0	+3·9	

* The total includes 13·5 million kWh generated by oil engines and 4·5 million kWh by waste heat plants in December.

TABLE II—ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for December			Cumulative totals for nine months April-December			Totals for 12 months ended 31st December		
	1951 Mill. kWh	1952 Mill. kWh	Inc. or Dec. %	1951 Mill. kWh	1952 Mill. kWh	Inc. or Dec. %	1951 Mill. kWh	1952 Mill. kWh	Inc. or Dec. %
London	532·6	611·9	+ 15·5	3,657·2	3,788·4	+ 3·6	5,254·0	5,429·7	+ 3·3
South Eastern	301·8	351·1	+ 16·3	2,096·3	2,218·7	+ 5·8	2,959·6	3,137·3	+ 6·0
Southern	339·4	400·4	+ 18·0	2,400·2	2,599·2	+ 8·3	3,367·5	3·649·3	+ 8·4
South Western	163·9	190·0	+ 15·9	1,187·9	1,258·4	+ 5·9	1,674·3	1,758·6	+ 5·0
Eastern	479·0	566·1	+ 18·2	3,134·6	3,632·0	+ 5·7	4,839·4	5,098·4	+ 5·4
East Midlands*	392·9	457·0	+ 16·3	3,016·3	3,133·7	+ 3·9	4,196·6	4,356·7	+ 3·8
Midlands*	532·7	608·1	+ 14·2	4,085·4	4,218·6	+ 4·0	5,698·9	5,939·7	+ 4·2
South Wales*	275·5	297·0	+ 7·8	2,289·1	2,417·0	+ 5·6	3,044·7	3,266·8	+ 7·3
Merseyside & N. Wales*	315·3	334·8	+ 6·2	2,500·9	2,410·0	− 3·6	3,165·4	3,377·4	− 2·5
Yorkshire*	507·9	586·0	+ 15·4	3,955·7	4,169·7	+ 5·4	5,479·0	5,769·6	+ 5·1
North Eastern*	326·6	347·9	+ 6·5	2,566·3	2,532·6	− 1·3	3,513·3	3,508·5	− 0·1
North Western*	606·2	651·9	+ 7·5	4,648·2	4,522·6	− 2·7	6,382·1	6,353·7	− 0·4
South East Scotland	120·6	135·6	+ 12·4	835·6	880·6	+ 5·4	1,168·9	1,234·1	+ 5·6
South West Scotland*	292·3	335·1	+ 14·6	2,039·9	2,122·1	+ 4·0	2,860·5	2,979·7	+ 4·2
Total all Area Boards	5,186·7	5,875·9	+ 13·3	38,713·6	39,933·6	+ 3·2	53,904·2	55,850·5	+ 3·6
Direct Supplies by Central Authority	59·5	66·5	+ 11·8	519·9	545·6	+ 4·9	700·3	734·9	+ 4·9
Grand Total	5,246·2	5,942·4	+ 13·3	39,233·5	40,479·2	+ 3·2	54,604·5	56,585·4	+ 3·6
Mainly Industrial Areas marked*	3,249·4	3,617·8	+ 11·3	25,101·8	25,556·3	+ 1·8	34,640·5	35,543·1	+ 2·6
Mainly Non-Industrial Areas	1,937·3	2,258·1	+ 16·6	13,611·8	14,377·3	+ 5·6	19,263·7	20,307·4	+ 5·4
Total Number of Working Days	26·94	27·47		249·01	248·77				

* Over half the total sales by the Boards in 1951–52 were to industrial consumers.

Metrovick set and 320,000 lb/hr Yarrow boiler. Bromborough: 50 MW English Electric set. Thornhill: 45 MW English Electric set and 200,000 lb/hr Mitchell boiler. Blackburn: 40 MW English Electric set and 150,000 lb/hr Simon Carves boiler. Huncoat: 30 MW G.E.C. set. Woolwich: 30 MW G.E.C. set and two 180,000 lb/hr John Thompson boilers. Northampton: 30 MW C. A. Parsons set. Clarence Dock: 350,000 lb/hr B. & W. boiler. Warrington: 30 MW Brush set. West Ham: 180,000 lb/hr John Thompson boiler. Staythorpe: 240,000 lb/hr B. &W. boiler.

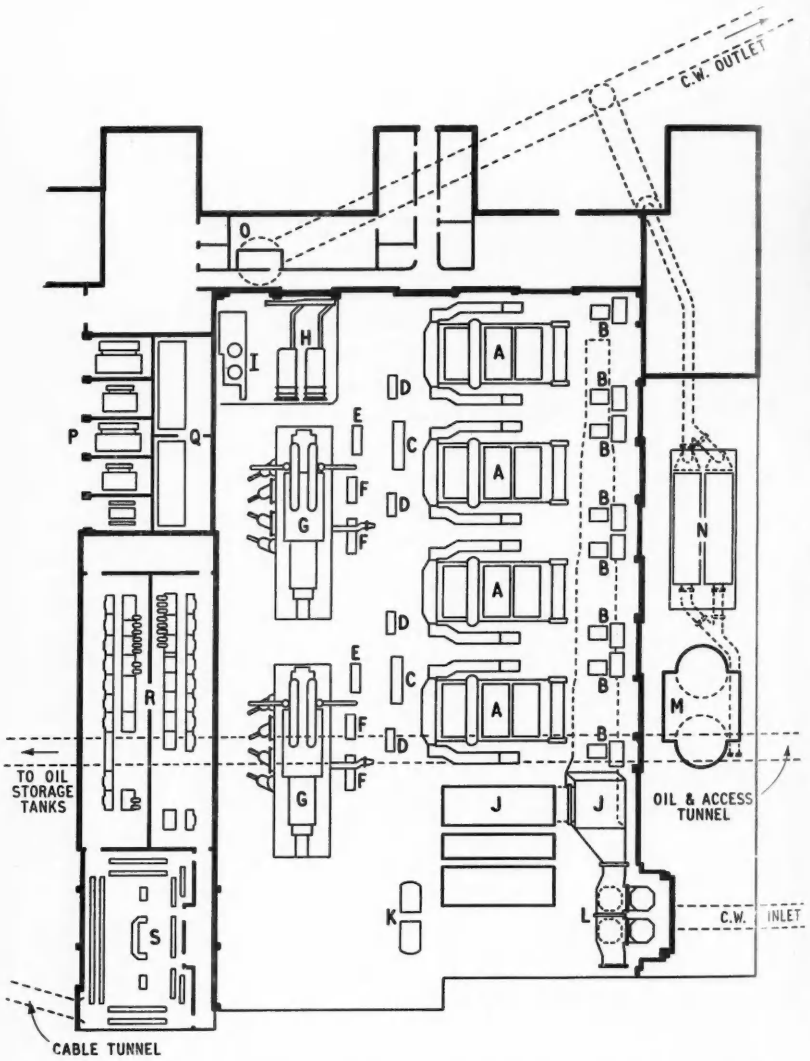
In the details of electricity sales by the Area Boards given in Table II the national figures show an increase over December, 1951, of 13·3 per cent which when corrected for weather and the number of working days, represents an increase of 5·7 per cent. The weather conditions were colder than in December, 1951. It must be borne in mind that the figures for December are only provisional and the corrections for weather and number of working days approximate. In addition, no account is taken of the supplies received by Area Boards from other sources ; these are comparatively small. Some major changes in supplies have taken place during the last two years and these will have an effect on the percentage changes of the Southern, South Wales, Merseyside and North Wales, North Eastern and Yorkshire Boards.

The national total for electricity sent out during the whole of 1952 at 56,585·4 million kWh shows an increase of 3·6 per cent. All the Boards sold more electricity in December but the Merseyside and North Wales, the North Eastern and the North Western Boards showed small reductions in sales for the full year.

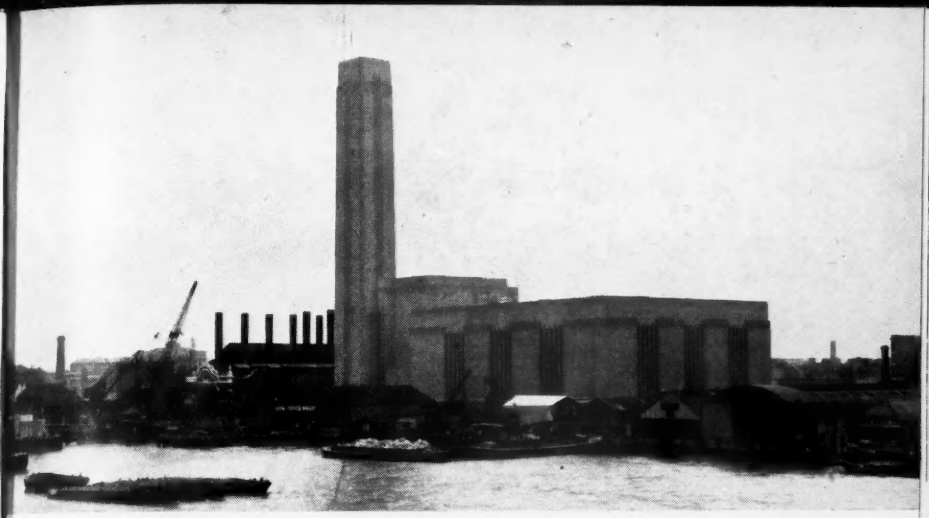
Londonderry Electricity Loan

THE Londonderry Electricity Committee has approved the request made by the city electrical engineer, Mr. R. V. M'Rory, for a loan of £17,000 to be raised to cover extensions to the city's electrical service and for the purchase of new equipment. The two principal items are extension of the Midland substation building and replacing obsolete switchgear and equipment (£7,080), and extending e.h.v. mains in Limavady Road, installing a transformer kiosk on a site adjacent to Deanfield and replacing a portion of l.v. mains (£4,660).

PLAN OF BANKSIDE "B" POWER STATION (FIRST HALF)



A—Boilers. B—Induced draught and forced draught fans. C—High-pressure heaters and panels. D—Boiler control panels. E—Turbine instrument panels. F—Extractor pumps. G—Turbo-alternators. H—Low-pressure auxiliary boilers. I—High-pressure evaporators for auxiliary steam. J—Flue-gas washer. K—"Mulsifyre" tank. L—Chimney. M—Aeration tank. N—Oil interceptors. O—Penstock outlet. P—Transformers. Q, R—22 kV and 66 kV switch houses. S—Control room



BANKSIDE "B"

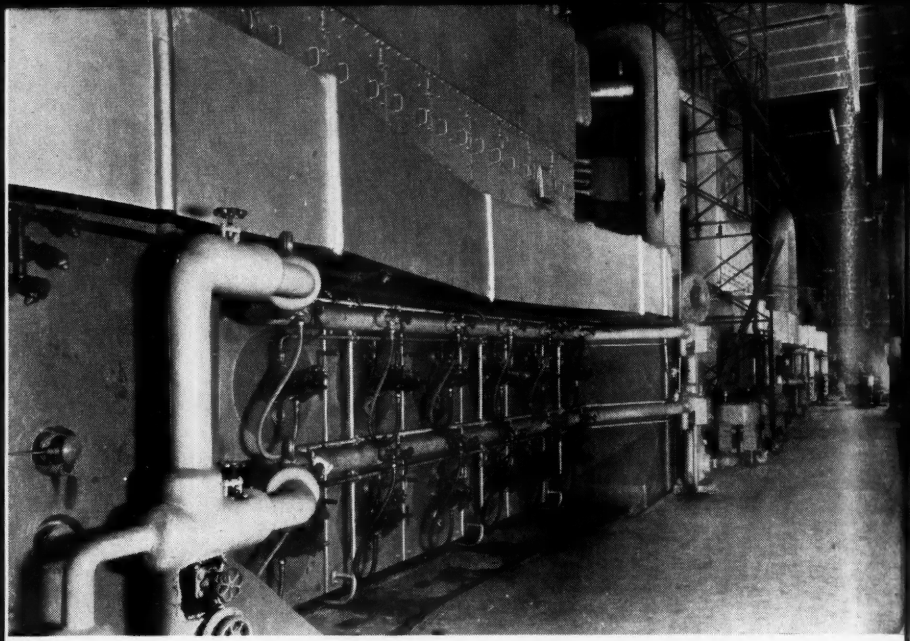
First Half of New Oil-Fired Station in Operation

THE first half of the new power station at Bankside, Southwark (designed by Sir Giles Gilbert Scott, O.M.) has now been put into service with one of its two 60 MW generating sets. The construction of the second half, to contain two similarly rated sets bringing the ultimate capacity of the whole station to 240 MW, will entail the prior demolition of the existing Bankside " A " station.

For the present installation in Bankside " B " steam is raised in four Foster Wheeler single-drum oil-fired boilers with maximum continuous and normal economic ratings of 375 and 300 k lb/hr. Three of these at 90 per cent m.c.r. can meet steam requirements for 120 MW. Steam conditions are 950 lb/sq in and 925 deg F with 370 deg at the inlet of the plain steel-tube economizers and 475 and 500 deg at the outlet at the two ratings. Each boiler has a furnace volume of 21,700 cu ft giving heat releases of 22,500 and 17,900 B.Th.U./cu ft.

Heating surfaces in sq ft are distributed as follows: water walls 13,025; convection bank 4,230; drainable convection superheaters, primary 7,543 and secondary 6,260; economizer 11,540; risers and superheater connecting tubes 4,085; air preheaters, primary (cast iron) 22,048 and secondary (steel) 50,000. A boiler convection bank comes between the primary superheater and the economizer. CO_2 is 13·7 per cent at furnace exit and 12 per cent at induced draught fan. Air heater temperatures are 100 deg F at inlet and 540 and 520 at outlet for the two loadings, at which total draught losses are 8·89 and 5·72in w.g. and final gas temperatures 350 and 331 deg F. Oil consumptions are 26,800 and 21,300 lb/hr, giving gross boiler efficiencies of 85·9 and 86·5 per cent.

Boiler output is regulated by varying the number of burners in use and the oil pressure. Twelve atomizing burners fitted with gas pilot jets for ignition are arranged in two rows in the front wall of the combustion chamber of each boiler. Fuel is delivered to these at 250 to 300 lb/sq in and 250 deg F by oil pumps driven by variable speed d.c. motors. The fuel is a heavy residual oil similar to Bunker C

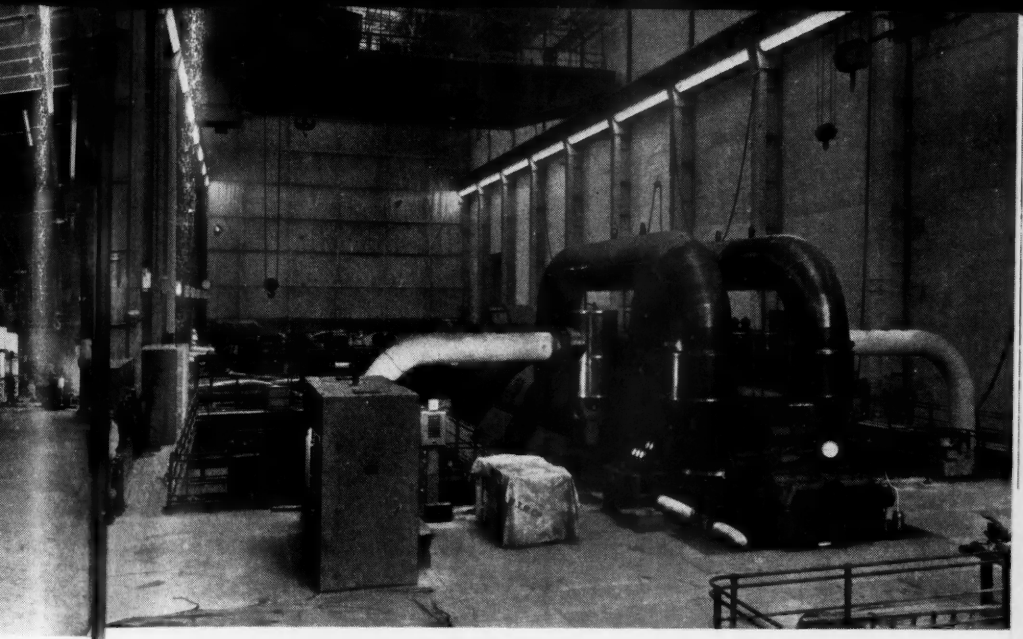


The oil-fired boilers; 375,000 lb/hr each

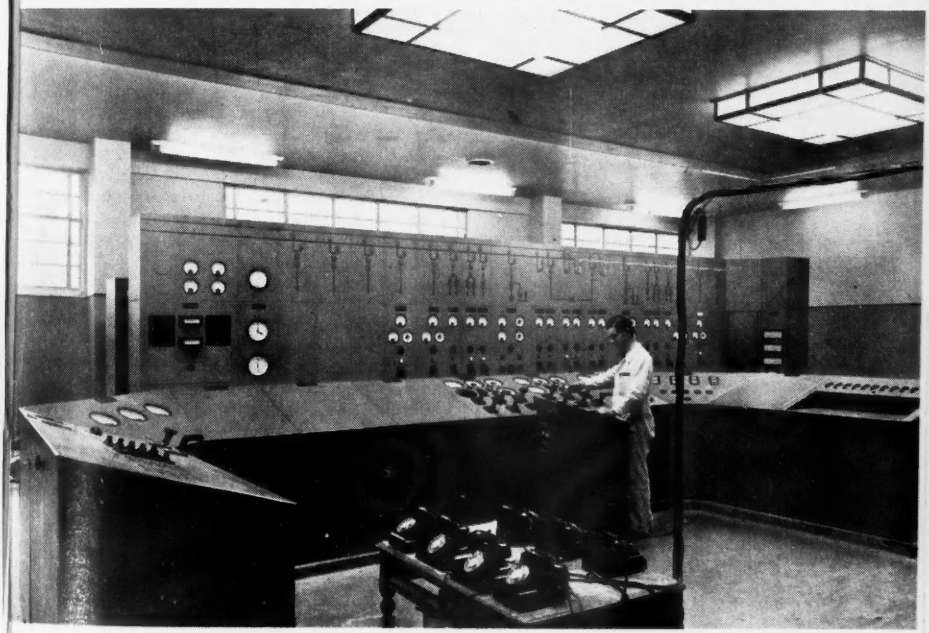
grade with a gross calorific value of 18,250 B.Th.U./lb, a specific gravity of 0·98 at 60 deg F and a maximum viscosity at 100 deg F of 6,500 sec Redwood No. 1. The sulphur content is 3 to 4 per cent. Forced draught is provided by two-speed vane-controlled fans and induced draught by two-speed fans of which two of each type are installed per boiler. Three 3,000 r.p.m. electrically driven and one steam driven feed pumps with common suction and delivery mains, serve the four boilers; delivery pressure is 1,250 lb/sq in for a duty of 600,000 lb/hr each.

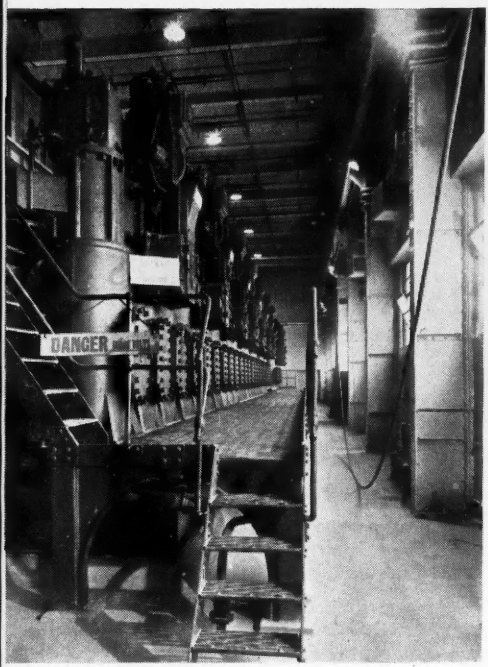
Steam sootblowers are electrically operated automatically in sequence from a panel at floor level. Effluent from the water washing of superheaters, boiler convection surface, economizers and primary air heater, is dealt with in separate collection and removal hoppers. A Sturtevant motor-driven multi-stage turbo-exhauster, with a 10 ton receiving unit and a filtration unit, collects dust from hoppers on the boilers and damps the dust, the consequent mud being deposited in a truck. A secondary function is the surface cleaning of the boiler house by a piping system with hose connections at numerous points.

The chimney, a single 40ft square steel-framed tower, 300ft above street level, houses four octagonal cast-iron flues, 11ft in diameter, which rise from a plenum chamber. This receives the gases from a washing chamber, the bottom of which is connected to a common flue of mild steel. Each flue is fitted with a damper and has a nozzle at the top so that at station loads above 25 per cent the gases may be discharged at a velocity of 60 to 120 ft/sec. The washing chamber is designed to remove 95 per cent of the sulphur dioxide contained in the flue gases from fuel oil with 4 per cent maximum sulphur content. It contains two absorption passes in series and a transfer pass and is packed to a depth of 55ft with timber scrubbers of egg-box construction. The wash water is pumped to the tanks through a 30in bore pipe by, at present, five pumps connected to the circulating water discharge culvert. Each pump has a duty of 220,000 gal/hr against a total head of 175ft. Chalk is injected into the water and is stored in the form of a 50 per cent slurry. The effluent from the chambers is acidic and is taken through rubber lined tubes to 45ft deep aeration chambers where air is passed through it

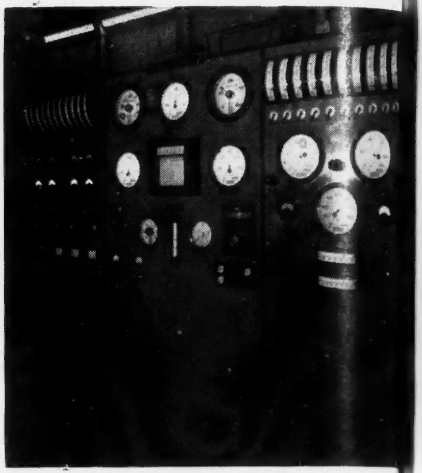


The first of the two 60 MW turbo-alternators in the new station and *(below)* part of the control room



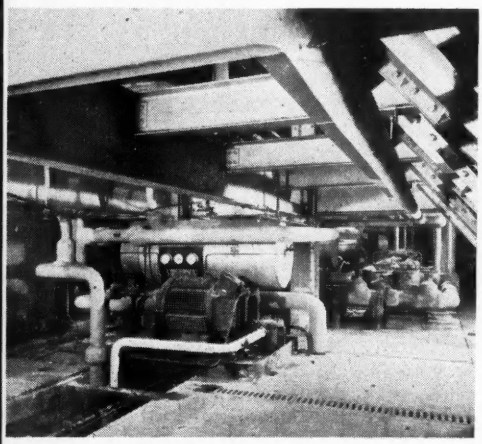


66 kV, 2,500 MVA switchgear gallery



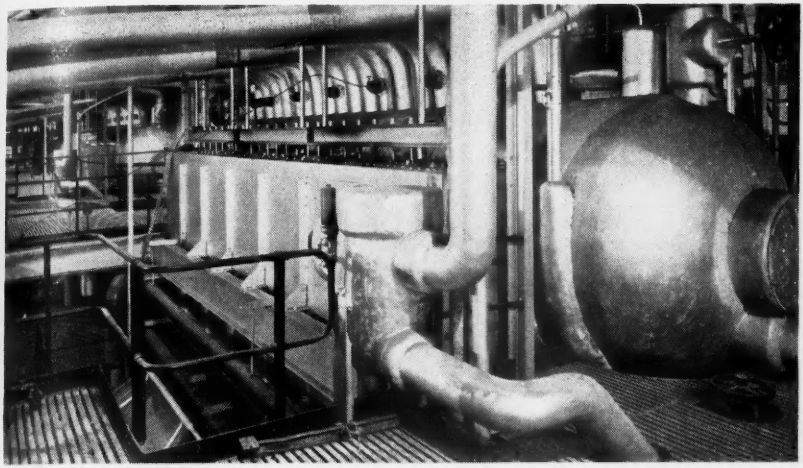
Boiler control panels

Fuel oil pumping and heating equipment for first two boilers



from a battery of compressors. It then goes through oil separators before joining the circulating water discharge for return to the river. This gas washing plant is not expected to be in commission for three or four months owing to difficulties experienced in obtaining cast-iron casings.

Fuel oil is normally delivered to the station by self-propelled and self-discharging 500 ton tankers from the new refinery at Shell Haven. Hose couplings from the tankers feed duplicate 10in bore pipes running from the jetty to three 4,000 ton mild steel storage tanks. Pumps are also provided on the jetty to discharge oil from towed barges. Three motor-driven pumps, each of 44 tons/hr capacity at 40 lb/sq in, can circulate the oil from the storage area through a 10in ring main to the boiler house and back to the tank, but gravity feed is used when tank levels are normal. Because of its high viscosity the temperature of the oil must be maintained at not less than 110 deg F. Small steam pipes are, therefore, run under the lagging of the oil pipe lines and the jetty off-loading and boiler house circulating pumps are steam jacketed. Steam at 250 lb/sq in for oil heating at the boilers and for general station heating is supplied from a separate auxiliary system; the pressure is reduced to 50 lb/sq in for oil pipe heating. This steam is raised in two 18,000 lb/hr evaporators in which are steam



Boilers at drum level

coils connected to the 900 lb/sq in range or else by two 5,000 lb/hr Cochran horizontal oil-fired boilers. Fuel consumption for the station when complete will be 67 tons/hr at full load or 850 tons/day for two-shift working.

There is no partition wall between boilers and turbo-alternators. The two turbines are two-cylinder 3,000 r.p.m. British Thomson-Houston machines with double flow low-pressure cylinders with a continuous maximum economic rating of 60 MW. The alternators are wound for 15 kV and are designed for a power factor of 0·875. Cooling is by separately driven fans. Exciters are mounted on the main shaft with a motor generator stand-by. Initial steam conditions are 900 lb/sq in and 900 deg F. With a vacuum of 29in Hg (Bar 30in) the steam consumption is 8·5 lb/kWh at m.c.e.r. Five feed heating stages produce a final feed temperature of 380 deg F.

Two travelling cranes (150 tons) are installed. Among the instruments on the operating panels near the turbines are indicators of any eccentricity of the turbine rotor or of axial expansion between rotor and casing due to unequal heating. For testing turbine steam consumption a permanent calibrated Venturi equipment with indicating, recording and integrating instruments has been provided.

Each turbine has a twin condensing plant with a total cooling surface of 50,000 sq ft taking 40,000 gal/min of water in two passes. Two 100 per cent three-stage steam-operated air ejectors are provided. The Richardsons Westgarth condensing and feed-heating plant operates on a closed feed system in which condensate quantity and feed demand of the boilers is balanced by a control valve actuated by the water level in the condensate receiver below the main condensers. Condensate is discharged from the receiver by extraction pumps through an air ejector, drain cooler, gland heater and low-pressure feed heaters and thence to a spray de-aerator in the basement. From the de-aerator it is pumped into the suction of the boiler feed pumps, which discharge it through three high-pressure heaters in series into the boiler feed mains.

Circulating water is drawn from an intake shaft, 18ft in diameter, at the jetty and flows through a 10ft cast-iron concrete-lined tunnel driven in the clay to a penstock chamber in the chimney foundation and thence to a reinforced concrete suction chamber in the basement. From this chamber the water is drawn by four vertical-spindle pumps, each capable of dealing with 1,640,000 gal/hr, and goes by individual rotary strainers to 42 and 60in diameter cast-iron pipes to the condensers. The discharge culvert, of asphalt-lined

reinforced concrete runs to an 18ft diameter discharge shaft and penstock. A 10ft concrete-lined tunnel driven in clay, 60ft below ground level, carries the water to the north side of the Thames close to Blackfriars Bridge, where it comes up to river bed level.

Each alternator is connected to the 66 kV system through a 66 MVA delta-star transformer. In the same tank is a 5 MVA 15/3 kV delta inter-star "unit" transformer, which together with two 7 MVA 66/3 kV transformers supply the station auxiliaries. For the smaller auxiliaries (generally 100 h.p. and under) the voltage is further stepped down from 3 kV to 415 V by seven 0·5 MVA delta-star transformers. Bulk supply is given to the London Electricity Board through four 25 MVA 66/33 kV delta-star and four 15 MVA 66/11 kV transformers.

The main 66 kV 2,500 MVA switchgear occupies three upper floors of the switchhouse—circuit breakers, selectors and condenser-bushing busbars in descending order. All circuit breakers are electrically operated from a control room on the same level, which also contains the control panels for the other high-voltage switchgear. Generator neutrals are earthed through voltage transformers. Those of the 66 and 22 kV systems have limiting resistors while for lower voltages earthing is direct.

The station building is of steel-framed brick walls and reinforced-concrete and when completed will be 545ft long by 240ft wide with central loading bay. The boiler and turbine house roof is 90ft above ground level. Main foundations have been taken down to London blue clay, which lies under 10 to 15ft of made ground and soft clay and 20 to 30ft of water-bearing ballast about 3ft below datum. About 5,500 tons of concrete was used for the first half of the station, including foundations for the common chimney structure. The switch house, which abuts on the turbine bay and is of the same height, also accommodates the control room and transformers at eight floor levels. Bankside "B" is connected to Battersea and Deptford power stations by two 66 kV cables in each case.

List of Principal Contractors

Foundations, superstructure, jetty and tunnel works.—Sir Robert McAlpine & Sons. Structural steelwork and gas washing structure.—Sir William Arrol & Co.

H.p. boilers.—Foster Wheeler. Fans.—James Howden & Co. (Land). Fan motors.—Lancashire Dynamo & Crypto. Oil burning equipment.—Todd Oil Burners. Boiler tubes.—Stewarts & Lloyds. Superheater tubes.—Talbot-Stead Tube Co. Ducting.—Richardsons Westgarth & Co. Economizer and primary air heaters.—E. Green & Son. Feed water regulators.—Copes Regulators. Valves and mountings.—Hopkinsons. Instruments.—George Kent. Steelwork.—Dawnays. Sootblowers.—Clyde Blowers. Piping.—C. A. Parsons & Co. Insulation.—Newalls Insulation Co.

Turbo-alternators. — British Thomson-Houston Co. Instruments.—George Kent.

Condensing and feedheating plant.—Richardsons Westgarth & Co. Feed pumps, condensate and de-aerator extraction pumps.—Mather & Platt. Motors.—Lancashire Dynamo & Crypto.

H.p. steam and feed valves.—Dewrance & Co. H.p. drain valves.—Sidney Smith & Sons. L.p. valves.—Whitt & Chambers. H.p. steam and feed pipework and h.p. and l.p. drain pipework.—C. A. Parsons & Co.

Oil handling plant.—Young, Austen & Young. Oil pumps.—Stothert & Pitt. Instruments.—Electroflo Meters. Insulation.—Newalls Insulation Co.

Fuel oil tanks.—Whessoe. Auxiliary pipework.—Matthew T. Hall & Co. Circulating water pipework.—Aiton & Co. C.w. pumps.—Drysdale & Co. C.w. strainers and h.p. evaporating plant.—Richardsons Westgarth & Co. C.w. valves.—J. Blakeborough & Sons. Chlorinating plant.—Wallace & Tiernan. Central evaporating plant.—Hick Hargreaves & Co. Water softening plant.—Permutit Co. Lifts.—Wm. Wadsworth & Sons. Turbine house cranes.—Sir Wm. Arrol & Co. Auxiliary cranes and hoists.—Wharton Crane & Hoist Co., G. W. King, and C. E. Reed & Co. Tanks and receivers.—Newton Chambers & Co. Station air compressors.—Broom & Wade. Dust handling plant.—Sturtevant Engineering Co. Heating and hot water services.—Young, Austen & Young. Auxiliary boilers.—Cochran & Co. (Annan). Fire protection equipment.—Mather & Platt. Main flue and dampers.—Whitt & Chambers. Sump ejectors.—Hughes & Lancaster.

66 kV switchgear.—Metropolitan-Vickers Electrical Co. 22kV switchgear and auxiliary 3 kV equipment.—Ferguson, Pailin. 11 kV switchgear.—Reyrolle & Co. 66 kVA reactors and 415 V switchgear.—British Thomson-Houston Co. 11 kV and 22 kV cables.—Siemens Bros. & Co. Transformers.—Ferranti. Cables and main station lighting.—G. E. Taylor & Co. Low-voltage cables.—Malcolm & Allan (London).

Flue gas washing plant: Spray water pumps.—Pulsometer Engineering Co. Strainers.—Richardsons Westgarth & Co. Main water and air pipework.—Matthew T. Hall & Co. Effluent pipework.—Aiton & Co. Chalk pumps.—Comet Pump & Engineering Co. Chalk slurry pipework.—Young, Austen & Young. Air compressors.—Broom & Wade. Instruments.—G. Kent. Aeration equipment.—Aerox. Sprays.—Dexine Rubber Co. Mixers.—Dorr-Oliver Co.

Fuel oil and lubricants.—Shell-Mex & B.P., Ltd.

Teachers' Conference at Bath

THE Electrical Association for Women is holding a one-day conference on the teaching of electrical housecraft at the City of Bath Training College of Domestic Science, Brougham Hayes, Bath, on 14th March. It is arranged specially for teachers in Somerset and nearby counties, and is open to all teachers interested in the subject. The syllabus includes sessions on "The Use and Care of Electric Cookers, Cooking Equipments and Refrigerators," "The Use and Care of Electrical Laundry Equipment," and "The Teaching of Electrical Housecraft in Schools."

Commerce and Industry

Cable Current Ratings

Scottish Exhibition of Coronation Emblems

THE latest recommendations of the Cable Makers' Association about current ratings for 33 kV solid type cables, impregnated paper insulated and lead covered, are set out in a new C.M.A. booklet on the subject. When comparing these second edition tables with previously published figures it should be noted that ratings are now included for 0·6 sq in conductors for three-core screened and three-core screened S.L. cables while the maximum conductor temperature for three-core screened S.L. armoured cables has been increased to 65 deg C for all installation conditions.

Other minor amendments have resulted from changes in cable dimensions, from the fact that trefoil groups of single-core cables are now assumed to be laid with vertex uppermost and from more accurate calculations of cable surface emissivity factor and of the surface temperature rise in air for each size of cable. Rating factors are also tabulated for variations in depths of laying, in the basic values of temperature and soil thermal resistivity, as well as for the grouping of buried cables and for those drawn into ducts.

Electrical Engineers' Exhibition

Over 82,000 sq ft of floor space will be occupied by the second Electrical Engineers' Exhibition organized by the Association of Supervising Electrical Engineers and to be held this year at Earls Court, London, S.W.5, from 25th to 28th March. Two special features are being arranged. In "Illumination Way" will be the latest lighting fittings from multi-fluorescent lamp types to single gasfilled lamp fittings, while "Commercial Cooker Avenue" will comprise the latest types of cookers to meet hotel, boarding house, restaurant or airport requirements. Over 100 manufacturers, as well as the British Electricity Authority, the British Electrical and Allied Industries Research Association and the British Electrical Development Association, are exhibiting. Equipment for lighting, heating, cooking, power, control, switchgear, cables, relays, thermostats, motors, transformers, meters, servicing and spare part replacements will be among the exhibits, and two awards and certificates are to be presented for the two outstanding labour saving devices, one for industry, another for domestic use. Admission will be by ticket obtainable from the A.S.E.E., 54, Station Road, New Barnet, or by trade or any Association's membership card.

Passenger Liner Installation

In the new 12,500-ton passenger liner *City of Port Elizabeth* of the Ellerman Line, built by Vickers-Armstrongs, Ltd., the complete lighting installation has been carried out by the General Electric Co., Ltd. For this scheme, which employs both fluorescent and tungsten light sources in all spaces, thirty-five special designs of fittings were prepared by the G.E.C. in collaboration with the builders and with the owners' superintendents. In the restaurant, verandah café and bar, drawing room and writing room, "Osram" hot cathode fluorescent tubes housed in the cornices give indirect lighting. These are supplemented by tungsten lamp

G.E.C. indirect fluorescent lighting, supplemented by tungsten lamps, in the verandah café of the "City of Port Elizabeth"

fittings finished in matt nickel plate; the fittings in the restaurant, verandah café, drawing room and entrances have pink-tinted glasses, while those in the writing room and verandah café bar have "Gecoray" reflectors. The ceiling fittings in the children's playroom are appropriately decorated with nursery motifs. In each cabin, fittings provide centre, mirror and berth lights. These fittings are matched in design, combining matt nickel-plated metalwork with champagne-tinted "Perspex" bowls relieved by engraved terra-cotta lines.

The smoke room has Jacobean style furnishings and, to enhance this effect, special designs of tungsten and fluorescent lighting fittings have been produced with an armour-bright finish. The tungsten lamps are mounted in ceiling-pendants and wall-brackets constructed as candelabra with a suggestion of wrought-iron work, while the fluorescent tubes are housed in unobtrusive troughs projecting 1ft from the wall.

The liner is equipped throughout with Henley ship-wiring cables comprising 50,000 yd of rubber insulated lead alloy sheathed and braided cables and 10,250 yd of varnished cambric ship-wiring cables.

Fire at Thorn Factory

The production of Ferguson radio and television receivers will not be affected by the fire which occurred at the Hirwaun (Glam) factory of Thorn Electrical Industries, Ltd., on 10th January. This factory is largely connected with the production of "Atlas" fluorescent fittings, and although considerable damage was done to the property and machinery, it is hoped that by the transfer of production to some of the other factories in the Thorn group, very little inconvenience will be caused to customers.

E.D.A. Public Speaking Competition

The London area staged the first contest in the 1953 E.D.A. Public Speaking Competition, when five men took the platform at the Lighting Service Bureau, 2, Savoy Hill, on 14th January. Mr. A. W. Bonell, A.M.I.E.E., showroom and trading superintendent, London Electricity Board, presided and the judges were Mr. F. C. Fenton, chief commercial officer, London Electricity Board, Mr. J. F. Middleton, education and training officer of the London Electricity Board and Mr. J. A. Stedman, education officer, E.D.A. The results were:—First, Mr. R. E. Hawkins (assistant in the Downham Service Centre, L.E.B.), who spoke on "Public Relations in Electrical Salesmanship"; second, Mr. R. A. Ashton (senior clerk, Lambeth district offices of the Board), whose subject was "The Influence of Electricity on the Coronation Celebrations." Mr. Fenton, in presenting the prizes, congratulated the competitors on the very high standard they had shown all the way through. What pleased him most was that this had been a competition for the male staff, as in previous years they had only had competitions among the female staff. Unfortunately, this year there was only one lady competitor from the London area.

Mr. Hawkins will represent London in the national finals, which will be held in London about April, when the finalists in the men's and women's sections throughout the country will compete for the Faraday silver challenge shields.

Coronation Decorations Exhibition

An exhibition of illuminated Coronation emblems and decorations, arranged by the South East Scotland Electricity Board and held in the Service Centre, George Street, Edinburgh, was officially opened on 12th January by the Lord Provost of Edinburgh, who was accompanied by the Lady Provost. They were welcomed by Sir Norman Duke, chairman of the Board, and Mr. W. S. Sawtell, deputy chairman.

The ceremony was attended by the Mayor of Berwick-on-Tweed, provosts and leading citizens from neighbouring towns, burghs and county councils, representatives of various Government Departments, trade associations and commercial undertakings.

The various emblems displayed were set off against a background of Coronation blue panels interspersed with special features to simulate banner decorations on building façades. The formation and sequence of the panels were such that the decorative effect of individual emblems was seen to advantage. The new red,

Exhibition of illuminated Coronation emblems and decorations by the S.E. Scotland Electricity Board

white and blue fluorescent lamps were used to good effect. Strip lighting, using special reflectors and lamps of various colours, was shown in the form of festoons between the main background panels. Various types and sizes of fittings for the illumination of gardens and window boxes were demonstrated. There was also a wide range of floodlights on display. The various emblems were provided by leading manufacturers who included the British Thomson-Houston Co., Ltd., Crompton Parkinson, Ltd., Edison Swan Electric Co., Ltd., Ekco-Ensign Electric Co., Ltd., Falk, Stadelmann & Co., Ltd., General Electric Co., Ltd., Philips Electrical, Ltd., Revo Electric Co., Ltd., Siemens Electric Lamps & Supplies, Ltd., and Simplex Electric Co., Ltd.

Lighting Service Bureau Activities

For the convenience of those who are unable to visit the Lighting Service Bureau during the day to see the collection of Coronation lighting ideas, it has been arranged to keep the Bureau at 2, Savoy Hill, London, W.C.2, open later than usual on 2nd and 3rd February, when it will close at 9 p.m. instead of 5.30 p.m.

The autumn evening design course last year was overbooked, and for the benefit of those who were unsuccessful in obtaining tickets, the course is to be repeated and will take place on Monday evenings from 16th February to 30th March. Early applications should be made for seats.

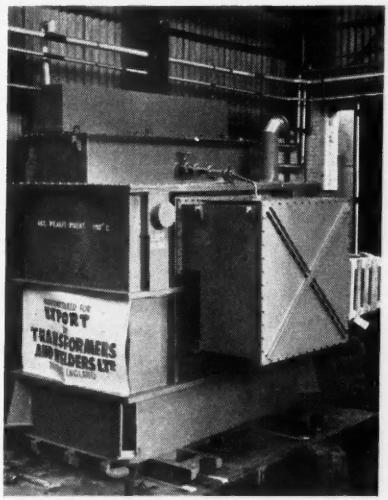
The Bureau has issued a new edition of its technical supplement No. 3, " Light and Colour." This is available, free of charge, on application to the Bureau in London, or to any of its provincial offices, but as it is primarily intended for the electrical industry, applicants are asked to give some indication of their connection with the industry.

E.I.B.A. Birmingham Branch

The annual ball of the Birmingham Branch of the Electrical Industries Benevolent Association will take place at the Tube Investments Social Club, Oldbury, on 13th February. Tickets (10s each) are now on sale and can be obtained from the hon. secretary, Mr. L. Wall, Electrical Components, Ltd., 102, Snow Hill, Birmingham, 4.

Large Transformer for Sweden

A 6,000 kVA 30 kV OFW arc furnace transformer, weighing 32 tons, was recently shipped to Sweden from the works of Transformers (Watford), Ltd. The transformer is designed for a secondary current of 26,500 A, and is fitted with a combined delta/star change-over and tapping switch on the h.v. windings to give ten l.v. voltages from 165 down to 64 V. In view of the heavy secondary current, a special technique has been adopted to minimize eddy currents in the windings, busbars and



A 6,000 kVA arc furnace transformer made by Transformers (Watford), Ltd., for Sweden

busbar clamping arrangements and to facilitate rapid dissipation of heat at all points. The electrical and mechanical construction throughout has been designed to withstand the particularly onerous conditions in arc furnace operation.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £166 0s 0d
COPPER, H.C. Electro	ton £285 0s 0d
Fire Refined 99·70 per cent ..	ton £282 10s 0d
Fire Refined 99·50 per cent ..	ton £274 0s 0d
COPPER Tubes	lb 2s 8¾d
Sheet	ton £340 0s 0d
H.C. wire and strip	ton £336 0s 0d
LEAD, English	ton £97 15s 0d
Foreign	ton £96 0s 0d
MERCURY	flask £70 10s 0d
TIN	ton £967 0s 0d
ZINC, G.O.B. Foreign	ton £87 10s 0d
Electrolytic	ton £91 0s 0d
BRASS Tubes	lb 2s 2¾d
Sheet	ton £271 0s 0d
Wire	lb 2s 8¼d
PHOSPHOR BRONZE	
Wire	lb 4s 1¾d
RUBBER, No. 1 R.S.S. spot ..	lb 24¼d-24¾d

Caroline Haslett Trust Lecture

On Monday last the eighth Caroline Haslett Trust Lecture was given by Miss M. B. Marris, under the chairmanship of Mr. L. Howles (chairman, South Wales Electricity Board), at the Institution of Electrical Engineers, London. Miss Marris, who was awarded the travelling

exhibition by the Caroline Haslett Trust last year, visited Norway to study conditions there. In her lecture she referred to the geographical difficulties in supplying electricity to various parts of the country. Nevertheless, 87 per cent of the population of 3¼ million people was given a regular supply and it was expected that this would increase to 95 per cent when sufficient financial resources were available.

After reviewing the various tariffs in force, Miss Marris spoke of the various domestic appliances in use and those for which there was a popular demand. The use of electricity on the farm was considerable, and if a farm was anywhere near any main, it had electricity, however isolated it might be. Great attention was paid to the teaching of domestic science in teachers' training colleges, in schools and in the home.

Uskmouth Emergency Services

Power supplies for switch tripping and closing and various emergency services at the B.E.A.'s new Uskmouth generating station at Nash, near Newport, Mon., are drawn from two storage batteries supplied and erected by Chloride Batteries, Ltd. The first, consisting of 120 Chloride SFG10 cells with a capacity of 500 Ah at the 10-hour rate, will be used for emergency lighting and switchgear closing. It can supply the emergency lighting load of 50 kW for 30 minutes and at the end of that period have sufficient capacity remaining to operate the oil switches, taking 197 A. The second and smaller battery, comprising 55 DSG6 cells with a capacity of 150 Ah at the 10-hour rate, will supply energy for switchgear tripping, closing, contactor coil operation, alarms and indicator lamps. The complete control gear for this battery and the trickle charger for the other were also supplied by the company.

Agency in India

Free India Traders, electrical engineers and importers of electrical plant and machinery, desire to act as agents in India for firms in the United Kingdom. Their address is 29, Churchgate Street, Bombay, 1.

Change of Address

C. MacKechnie Jarvis & Partners, consulting engineers, have removed to 53, Victoria Street, London, S.W.1 (telephone: Abbey 4751).

B.S.I. To Move

The British Standards Institution has announced that it will move at the end of next summer into a single, self-contained office block at 2, Park Street, Mayfair. Although the floor-space at "British Standards House," as the new home is to be called, is not substantially greater than that at present occupied by the B.S.I., concentration of the staff and facilities under one roof will aid efficiency and economy, and space will also be available for the many committee meetings which the B.S.I. convenes in the course of a year.

Pye Enter Appliance Market

An automatic tea and coffee maker (the "Polly") introduced by Pye, Ltd., marks the entry of the company into the appliance market for the first time since the war. It is probable that other lines will follow. The new set is similar to the "Tiffee" set made by the associated company, L. G. Hawkins & Co., Ltd., and described in our issue of 3rd October last.

Appliance Catalogue

A comprehensive electrical catalogue (No. 281), their first since 1939, is now available from Samuel Gratrix, Ltd., Quay Street, Manchester, 3. Containing over 176 pages, together with index, this well illustrated and priced volume deals with cables, conduit fittings, switchgear, lighting accessories, domestic appliances, etc. The covers of the catalogue are washable.

Trade Announcements

Young & Wildsmith, Ltd., 35, Little Russell Street, New Oxford Street, W.C.1, are now operating their warehouse and stores on Saturday mornings from 8.30 to noon, with normal delivery services. This also applies to their Ilford and Luton Branches, and to Young & Wildsmith (Reading), Ltd.

E. K. Cole, Ltd., announces that production of the Ekco solder pencil has been suspended through pressure of other work. Full spares facilities are available to users of existing solder pencils.

Catalogues and Lists

Croydon Precision Instrument Co., 116, Windmill Road, Croydon, Surrey.—Illustrated technical leaflet on precision electrical measuring instruments (51).

Micramatic, Ltd., Wootton Mount, Old Christchurch Road, Bournemouth, Hants.—Leaflet illustrating the new "Slimline" medium cold cathode lighting fitting.

Oliver Pell Control, Ltd., Cambridge Row, Burrage Road, Woolwich, London, S.E.18.—"Varley" Coil Designers' Handbook—a 14-page technical booklet containing a useful table for coil calculation (JS.3).

Northern Aluminium Co., Ltd., Banbury, Oxfordshire.—"Aluminium Mining Equipment"—a 44-page booklet illustrating the uses of aluminium equipment underground.

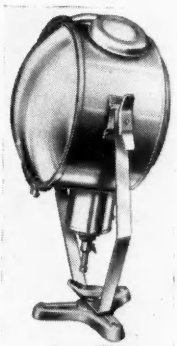
Hotpoint Electric Appliance Co., Ltd., Fletton, Peterborough.—Illustrated priced folder on electric water heaters.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Floodlight Projector

THE R.E.A.L. "Fifty Three" floodlight projector made by ROWLANDS ELECTRICAL ACCESSORIES, LTD., Hockley Hill, Birmingham, 18, combines all the essentials of a high efficiency narrow beam projector, with the addition of a new universal point focusing device. The body is fabricated from heavy gauge sheet steel, with a wide-aperture ventilating device at the top, and is mounted on a "U" shaped supporting bracket.



R.E.A.L. "Fifty-Three" 1,000 W projector

Trimmings and non-essentials have been eliminated to lower the cost, which is 180s for a unit taking a 500 W gasfilled or Class B projector lamp, or 240s for a 1,000 W model. These prices are for rimpled parabolic reflectors: plain parabolic reflectors cost 15s more. An extra 15s is also charged for a heavy cast base with clamping bar, which not only facilitates mounting but is of great assistance in final adjustment and focusing.

Stabilized Power Pack

The stabilized power supply unit which is available from HARVEY ELECTRONICS, LTD., 273, Farnborough Road, Farnborough, Hants, has a d.c. output of up to 120 mA variable continuously from 200 V to 350 V. Other models are available within the maximum range of 150 V continuous variation and an upper limit of 400 V, that is 250 V to 400 V, 150 V to 300 V and 100 V to 250 V.

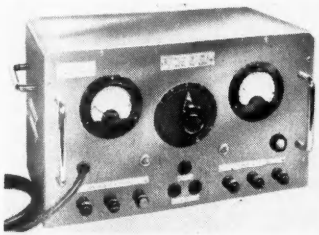
All units have an a.c. output of 6·3 V at 3 A with a 4 V tapping. A variation in mains input of ±10 per cent produces a d.c. output voltage variation of less than ±0·5 per cent, a change of no load to full load produces an output voltage variation of the same order. The units will operate from 200/250 V, 50/60 c/s mains, but can be supplied for 100/130 V, 50/60 c/s without extra cost.

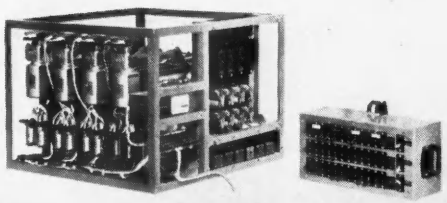
Remote Control Dimmer

Of particular interest in connection with the Coronation illuminations, the "Atlas" remote control dimmer bank comprises a four-colour motorized dimmer to control six 5ft 80 W four-tube fluorescent floodlights with a remote master control panel. The units are of the 100 step radial lever type driven by double reduction geared motors giving three complete dimming cycles per minute. Mounted within an enclosed weatherproof iron framework, which also houses chokes, relays and fuses, each dimmer is completely self-contained and can be replaced by one of a different rating in a few minutes.

The compact control panel communicates with the dimmer unit by a single multi-core telecommunication cable. The bottom row of telephone type switches puts each group into a "raise," "hold" or "lower" position; the middle row provides "blackout," "dimmer" and "master blackout" facilities while the

Left: **Harvey stabilized power unit.** *Right:* **"Atlas" remote control dimmer bank**





upper row provides "short circuit," "dimmer" and "master short circuit" positions for instantaneous full lighting irrespective of the setting of the individual dimmers. Master switches at the end of each row give simultaneous operational control. If required, an auxiliary feature can be supplied to give an automatic colour changing sequence. Control panels are designed to control one, two or more motorized units, the one illustrated being for three units.

This equipment, apart from its use in general outdoor illumination schemes, is suitable for open-air theatres, festivals, carnivals, pageants and tattoos where it provides, at low cost, lighting control comparable with the most up-to-date theatre stage installations. A number of these units are available for hire, together with the appropriate "Atlas" fluorescent lighting fittings, from the Theatre Lighting Section, THORN ELECTRICAL INDUSTRIES, LTD., 233, Shaftesbury Avenue, London, W.C.2.

Domestic Lighting Fittings

A new range of contemporary domestic lighting fittings is announced by GEORGE FORREST & SON, LTD., 30, Osborne Road, London, W.3, a subsidiary of Thorn Electrical Industries, Ltd. A great variety is achieved by the combination of a few adaptable basic components. Table lamps, wall brackets and floor standards, each employing one or more reflectors, consist of anodized duralumin rods, special lever handled clips and aluminium spinnings in three shapes and various colours. Semi-direct and semi-indirect pendants use glass, "Perspex" or buckram to good effect.

Improved Shaver

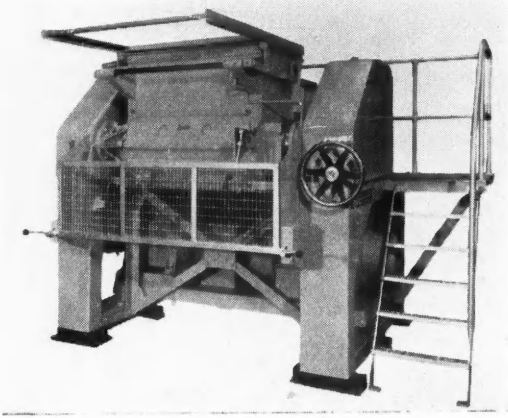
The "Kub" electric shaver made by CHILTON ELECTRIC PRODUCTS, LTD., Hungerford, Berks, is now available with a variable control incorporated to permit use on any voltage between 180 V and 250 V a.c. The shaver, the price of which remains at 4 guineas, is also now available in two colour schemes with either red or grey flaps and side lines.

A redesigned shaver socket, available in three different models, provides a convenient means of operating shavers of British, Continental and American design without the need for multiple adaptors and resistances.

DOUGH TREATMENT MACHINE

A HIGH-SPEED mixing machine, built by the Morton Machine Co., Ltd., Wishaw, Scotland, is used in a process patented by Joseph Rank, Ltd., for producing white bread without chemical bleachers and improvers, such as agene, using untreated and unbleached flour. In this "aeration process" half the flour used in the final dough is whipped with water at high speed for about 5 min by two statically balanced blades. During that period enough oxygen is taken from the atmosphere to produce a batter which, when discharged from the mixer, acts as an oxidizing agent to bleach and improve the other half of the floor in a normal dough-kneading machine. For the past eighteen months bread has been produced commercially in these machines by Beatties Bakeries, Glasgow, the largest bakers in Scotland.

The machine is driven by a 60 h.p. Brush electric motor operating through a gear box to a chain drive which in turn drives helical gears on both beaters. The container of the mixer is of special shape to facilitate discharge of the batter and it is jacketed for temperature control which is vital to the mix. All safety guards are electrically interlocked during operation. The one-sack (280 lb of flour) machine is not designed for doughing, but is capable of feeding a number of the orthodox types of dough-kneaders.



This Morton machine enables white bread to be made from unbleached flour without the use of chemicals

ELECTRICITY SUPPLY

Egypt and the Owen Falls Project

South Glasgow 11 kV System Modifications

FINANCIAL agreements relating to the cost of the Owen Falls dam and reservoir in Uganda have been approved by the Egyptian and British Governments. By these agreements Egypt agrees to bear the extra cost of raising the level of Lake Victoria and using it for water storage. Certain compensation payments will also be made by Egypt, which will additionally pay the Uganda Electricity Board the sum of £980,000 in respect of loss of hydro-electric power.

South Glasgow Reinforcement

In 1949 the South West Scotland Electricity Board approved a major reinforcement scheme at 33 kV in the southern area of Glasgow including the construction of 33/11 kV substations at Newlands and Burnfield (Thornliebank). A scheme has now been approved by the Board providing for the necessary modifications to the existing 11 kV network in that area following upon the construction of the 33 kV network. This comprises the establishment of two new 11 kV substations at Mearns Castle and Giffnock Colliery, the installation of 250 MVA switchgear at other existing 11 kV substations, and the laying of new lengths of 11 kV underground cable. The total cost of this work is estimated at £154,300 and it is intended to complete it by 1956.

Route of 275 kV Line

A meeting of farmers and representatives of amenity societies in the Hexham area of Northumberland is to be held to discuss the proposed route of a 275 kV overhead line from Blaydon to Carlisle which passes through the area. The route of the line has been approved by the Ministry, but the farmers, who state that valuable farm land will be interfered with, have threatened to withhold wayleaves. The meeting between farmers and amenity societies is to try to reach agreement on an adjustment of the route for submission to the B.E.A.

Roxburgh–Christchurch Link

Power will be transmitted from the 320 MW Roxburgh, New Zealand, hydro-electric station by 220 kV lines terminating at a substation to be built at Islington, on the outskirts of Christchurch. A contract for the building of the substation has been let, through the Ministry of Works, to a Christchurch firm. On present plans, the substation will be completed in time to receive power from Roxburgh's first generators, which the contractors aim to bring into operation in July, 1955.

Northumberland Farmers Complain

The Northumberland Branch of the National Farmers' Union has received complaints about the charges imposed by the North Eastern Electricity Board for supplying electricity to farms. In one case, it is stated, the Board charged £650 for an extension of only 35 yd. This high cost was due to the installation of a transformer, which remained the property of the Board, and it is contended that this equipment is part of the service which should be provided free by the Electricity Board.

Terms for Supplying Estates

Negotiations have been completed between the North Eastern Electricity Board and the Durham County Boroughs Committee regarding terms for supplying electricity to new housing estates. Local authorities will lease substation sites to the Board at a rent calculated at 4 per cent of the value of the land for housing purposes. Subject to the Board's providing ducts at its own cost and supplying the necessary information before the construction of a road has commenced, the Council will at its own cost place such ducts in the road as the Board may require. The Board will bear the cost of placing cables under footpaths and the Council will provide at its own cost such access ducts as are necessary for entry to the Board's service cables from the outside to the inside of houses.

Development in North East

The quarterly report of the North Eastern Electricity Board submitted to a meeting of the Consultative Council stated that a further 82 substations had been brought into operation. Of these substations 44 were for supplies to villages and farms and the remainder for new housing estates and reinforcing existing networks. During the quarter 104 farms were connected against 106 in the same period of

1951. In addition, eleven villages were supplied. The Board also approved development schemes estimated to cost £859,747, including 84 housing and 57 rural schemes. Surveys were carried out for the transfer to the Electricity Board of networks owned by the National Coal Board. In the villages of Linton and Lynemouth (Northumberland) the negotiation of wayleaves was completed and construction work started.

Canadian Line Designed for 345 kV

Reference was made in the *Electrical Review* of 2nd January, page 43, to the construction of a transmission line in British Columbia which is designed for operation at 345 kV. The immediate function of the line, which is operating initially at 230 kV, is to feed power from the new Wahleach development into the B.C. Electric Railway Co.'s system, but it is designed for later extension to the Bridge River. With the addition of a second conductor per phase it will operate at 345 kV, being the first line on the American continent to be built for this voltage. The transmission line towers are of a somewhat unusual design, consisting essentially of two latticed masts, joined by a cross-arm, the underside of which is 85ft above the ground. The cross-arm is 74ft long, giving a spacing between conductors of 35ft. This design was chosen as it requires a minimum of tower steel, each tower above the foundations weighing only 15,000 lb. The upper section of each mast is of welded construction and the lower section bolted. There are 340 towers in the line, spaced about 1,000ft apart. The conductor used is steel cored aluminium slightly over 1in in diameter; 560 tons were needed for the 65 mile line. The insulator strings are each made up of 21 porcelain discs, 10in in diameter and 5¾in long. Plans are already under way for a new terminal station in Surrey Municipality to receive the power when operation at the higher voltage is begun, but initially the line terminates at the company's Kidd substation in Vancouver.

South Madras Silver Jubilee

Last September the South Madras Electricity Supply Corporation, Ltd., celebrated the twenty-fifth anniversary of the introduction of a public electricity supply by the Trichinopoly–Srirangam Electric Supply Corporation, Ltd. (which in 1940 was merged with the East Tanjore and East Ramnad Electric Supply Corporations to form the present company). A souvenir brochure has been sent to us in which the history of the undertaking is set out.

Seshasayee Brothers, the promoters of the enterprise, had already carried out pioneer work in the electrification of some of the famous temples of India, including those at Rameswaram and Madura. When the Trichinopoly supply was switched on by Sir T. Desikachari, the first chairman, in 1927 the plant consisted of two 150 h.p. sets to serve 40 consumers and in 1929 the service was extended to Srirangam with only ten consumers. Thereafter the number of consumers quickly increased to 1,000 and further plant was added to bring the installed capacity to 2,100 h.p. in 1933. Besides the electrification of existing industries such as rice milling, flour grinding and oil pressing, the availability of electricity attracted new industries, including the manufacture of industrial diamonds, tapes and ribbons, slates and slate pencils, wire nails and aluminium utensils, scents, sandalwood paste, cosmetics and confectionery. Mining of gypsum in the rich mineral district of Ariyalur also followed in the wake of the coming of electricity.

At the present time the demand is far in excess of the availability of electric power and there is a waiting list of many potential consumers. The total number served is 39,686, the maximum demand in 1952 being 15,235 kW and sales 63·8 million kWh. Some 430 villages have been connected to the supply.

Installations in Houses

Consett (Co. Durham) U.D.C. is urging the North Eastern Electricity Board to proceed at an early date with the installation of electricity in houses at Leadgate. The Board has informed the Council that it would be two years before this work could be carried out, but the Board is being pressed to do the work during the present year.

Engineering Education Conference

A ROUND-TABLE conference on engineering education was held in London from 12th to 17th January with the object of furthering a better understanding between the various participating countries of the methods adopted by each for the education and training of professional engineers. The conference was organized as the result of a decision at the last meeting of the Conference of Representatives from the Engineering Societies of Western Europe and the United States of America (E.U.S.E.C.) at The Hague in 1951 to improve the means of exchanging information about this subject.

In addition to the working sessions, which were held at the Institutions of Civil, Mechanical and Electrical Engineers in turn, delegates paid visits to the engineering laboratories of Cambridge University, of the Imperial College and the technical colleges at Brighton and Rugby. While at Rugby they also had an opportunity of studying typical practical training schemes for professional engineers. Three or four delegates attended from societies in each of ten European countries as well as the United Kingdom and the United States.

Street Lighting Notes

AT a meeting of the COLNE VALLEY U.D.C., it was reported that authorization had been received from the Ministry of Transport for electric lighting on part of the Huddersfield-Oldham road between West Slaithwaite and Marsden, with an offer of a 50 per cent grant, providing the scheme did not substantially exceed the estimate of £3,100. It was also stated that the starting date for the scheme would be 1st April.

Extensive schemes for improving PETERBOROUGH'S street lighting are now being prepared and Ministry of Transport sanction is being sought.

DURSLEY Council has decided that the town next year will be illuminated by sodium lamps. At present lighting is by gas.

EASTBOURNE Corporation is recommended to make application to the Ministry of Housing and Local Government for sanction to borrow £2,516 for improved street lighting in Langney Rise and Friday Street from Langney Green to Beggars Lane.

CHELTENHAM Street and Highways Committee proposes that provision shall be made in next year's estimates for lighting a portion of Hatherley Lane between Unwin Road and Gloucester Road by 45 W sodium lamps on 15ft concrete posts at an estimated cost of £1,134.

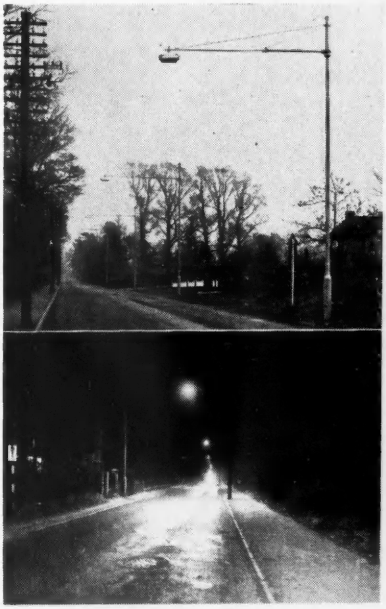
BROADSTAIRS Urban District Council has received formal consent from the Ministry of Housing and Local Government to the borrowing of £1,829 for improved street lighting in High Street, Queen's Road and Ramsgate Road.

DARLINGTON Town Council has received sanction to borrow £9,000 for improved electric street lighting in Haughton Road and Tubwell Row.

BOOTLE Works Committee is applying to the Ministry of Transport for sanction to borrow £5,506 for sodium lighting in Rimrose Road, Derby Road, Knowsley Road and Strand Road.

COVENTRY Housing Committee recommends the acceptance of the estimate of the city engineer amounting to £8,082 for the installation by direct labour of 253 street, footpath and garage lamps on various housing estates.

Unusually long projection brackets are employed for securing central lighting of Wergs Road, TETTENHALL, near Wolverhampton. The 59 street lighting units comprise Revo C.13660 cut-out fittings housing 140 W sodium discharge lamps. They are mounted on Revo tubular steel standards with brackets of 12–20ft projection. This type of equipment



New street lighting at Wergs Road, Tettenhall, showing the long extension brackets to bring the lanterns over the centre of the roadway

is very suitable for a road such as this, lined with tall trees which would cause considerable obstruction to a normal scheme. Installation of the street lamps was carried out by the Revo Street Lighting Department under the direction of Mr. J. W. Mason, surveyor to the Tettenhall U.D.C.

In September last, in an effort to save £1,000 a year, the AYR Town Council introduced 60 W lamps for side streets, but since then there have been many complaints. On 13th January the Council suspended standing orders and by 9 votes to 8 agreed to revert to 100 W lamps. When reference was made to lamps remaining alight for three days, the Council agreed to approach the Electricity Board with a view to the installation of a central control system to prevent a repetition of the daylight burning.

DOVER Works Committee proposes to increase the wattage of 300 street lamps from 60 to 100 W. Improved lighting of trunk roads is also recommended.

At the invitation of SUNDERLAND Corporation, North East local authorities are to make a joint protest to the North Eastern Electricity Board against new street lighting charges to come into operation in April.

MANUFACTURING PROGRESS, 1952

British Thomson-Houston Co., Ltd.

CONSIDERABLE activity on both "standard" lines of equipment and on the development of special plant and apparatus is reported by the British Thomson-Houston Co., Ltd.

Two further 60 MW turbo-alternators were ordered by the British Electricity Authority for the Marchwood power station and two additional 30 MW sets for the Goldington, Bedford, station. The Goldington turbines will each have the valve chest on the bottom half of the casing and will be supplied with steam through a single separately mounted stop valve.

The London Transport Executive ordered a 20 MW 50 c/s alternator to replace a 25 c/s machine at Greenwich.

A 25 MW turbo-alternator shipped to Windsor, Ontario, for the Ford Motor Co. of Canada, is designed for the double extraction of steam and has a hydrogen cooled alternator. The steam extraction figures are 240,000 lb 220/hr at 175 lb/sq in for process, and 310,000 lb/hr at 12 lb/sq in for heating.

Designs were being prepared for various large new turbines to operate on a reheat cycle, ranging from 60 to 120 MW.

A 3·72 million cu ft/hr turbine-driven blast furnace blower on order by the Workington Iron & Steel Co. will have backward inclined vane impellers and a partial spiral diffuser system to afford improved adiabatic efficiency.

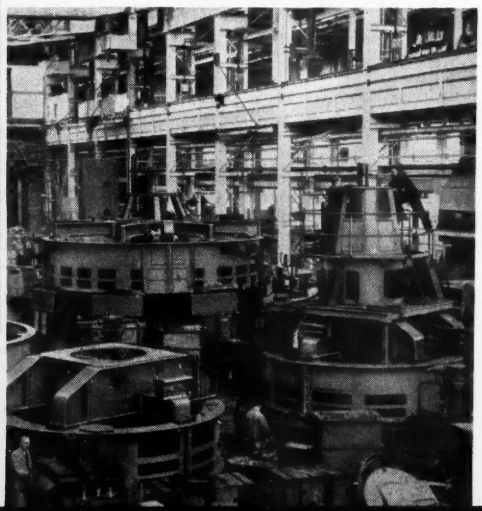
Tests were made at Rugby on a large two-stage double-flow steam turbine-driven gas booster for dealing with two million cu ft/hr of gas at 176in w.g., to be installed at the Fulham Gas Works.

Hydro-electric machines of the largest physical dimensions completed during the year were the first three vertical alternators for the Uganda Electricity Board's Owen Falls station. Although rated at only 16,700 kVA these low-speed machines measure 28ft over the casing. A special excitation system enables a high rate of response to be readily obtained despite the low speed. An electronic voltage regulator controls an amplidyne pilot exciter feeding the field of a buck-boost exciter which is in series with the main constant voltage exciter supplying the alternator field. The alternators are to be driven by Kaplan turbines and are capable of withstanding an overspeed of 298 r.p.m.

Many synchronous motors were supplied for mine ventilating fans in South Africa, etc., and an 8,500 kVA machine for installation in Bungsar power station, Malaya, is started in a novel manner. The starting motor is an a.c. commutator machine supplied from a three-phase low voltage source. The motor is started as a slip-ring induction motor, its speed being adjusted by moving the brushgear until the condenser is running at the correct speed.

In the switchgear field orders booked for the type J.B. breaker range, with all three phases in one tank, constitute a record. Thirty are for the Electricity Supply Commission of South Africa, 14 for the South Wales Electricity Board and 15 for the Government of Uttar Pradesh, India. But perhaps the most important development in this switchgear was the extension of the range to include 110/132 kV service at ratings up to 1,500 MVA. The first two circuit breakers of this type to be completed,

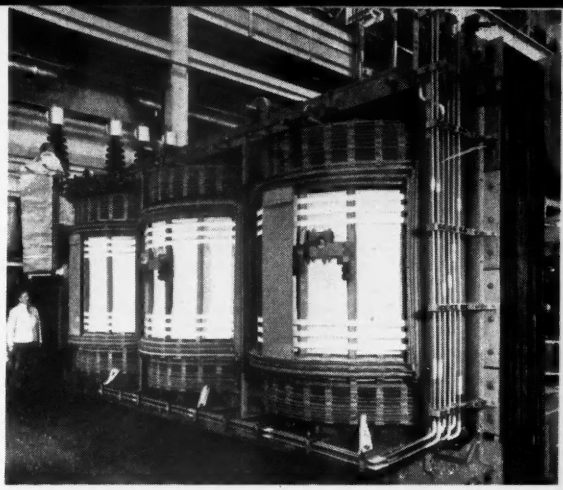
One of the 16,700 kVA vertical alternators for the Owen Falls power station is shown in the background of this view of a section of the company's heavy plant factory



750 MVA 110 kV, are being supplied to the Dunedin City Council, New Zealand.

Further development was carried out on h.v. air blast circuit breakers, andthree such equipments at 132 kV, 2,500 MVA, were commissioned at the Brunswick Wharf power station.

There has been much activity in the power transformer department, and the fourth generator transformer (75 MVA 14/132 kV) for the Staythorpe power station was completed. The first 120 MVA transformer for the 275 kV super grid is nearing completion and new orders include two more 120 MVA 275/132 kV auto-transformers.



Work is well advanced on the 120 MVA transformers for the 275 kV transmission line between Staythorpe and West Melton; core and coils of one equipment

The production of pumpless steel tank rectifiers for railway and electrolytic duty continued at a high rate, and the commissioning of the installation at Uniao Fabril do Azoto, Portugal, was an event of some importance.

The output of electronic equipment was a record, and among the many developments was a novel spot-seam welding control in which the conventional resistance-capacity timing circuit is replaced by two "Dekatron" counting tubes.

The demand for photo-electric cell equipments increased considerably and developments took place in photo-electric cell relays, register controls, and pinhole detectors. Referring to the last mentioned, in one case the equipment detects a pinhole of 0·01in diameter in a steel sheet travelling at 1,000 ft/min.

The 15 h.p. "Emotrol" equipment has been rebuilt as a floor-mounting unit with a view to its use as a six-phase, half-wave rectifier with an external rectifier transformer for motor ratings up to 40 h.p. It will thus supersede the present 45 h.p. "Emotrol." An order for eleven 100 h.p. "Emotrol" units was received from the Ministry of Supply for a special application which calls for equipments to be used individually to control a 100 h.p. motor or, in parallel, to control a 200 h.p. motor from a single control station.

The standard range of h.f. induction heaters was extended to 25 kW, and several standard heaters were modified for special applications. One such application required 10/800 kVA at any one of four work stations selected by manual switching.

Work in the cinema world was advanced, and one outstanding installation was in the Odeon, Leicester Square, London, where the original equipment installed in 1937 was replaced by S/U/P/A/ projectors. The amplifier has an output of 90 W and feeds the new loudspeaker system which is designed to suit the particular auditorium.

Industrial heating work was typified by the development of a self-contained 15 kW forced draught fan air heater and its application to grain drying. The unit construction comprises a centrifugal fan with the three-phase "Pyrobar" air heater mounted on the casing. The heater and fan circuits are suitably interlocked.

The principal orders received in the marine world covered turbo-alternator sets for new ships for the tanker fleets of the British Tanker Co. and the Anglo-Saxon Petroleum Co. Among the main propulsion equipments completed or in hand the chief interest centres around the gas turbine and in this connection the latest news from the *Auris* is that its propulsion unit is giving complete satisfaction.

An early development in the year in rail transport was the receipt of an order by British manufacturers for new rolling stock for the Toronto subway. The 104 motor coaches will be equipped with the company's electro-pneumatic camshaft control. Activity continued in the diesel-electric field

and eight more equipments were ordered for the Ruston 165 h.p. shunters. Work went ahead on the ten 1,000 h.p. diesel-electric locomotives for the New South Wales Government Railways and on the 400 h.p. diesel-electric shunters for the Western Australian Railways.

Outstanding aircraft developments were the inauguration of the B.O.A.C. service to South Africa, using Comet aircraft, and the first flight of the " Princess " flying boat. The electrical power systems in both these aircraft were developed and supplied by the company, and although most of the electrical equipment is housed under air pressure, it was designed initially to operate at 40,000ft.

The following are a few selections from the many outstanding industrial applications. The drive for the new stainless steel sheet mill of Firth-Vickers Stainless Steels, Ltd., Sheffield, and total h.p. for the two stands (roughing and finishing), edger, screwdowns, edger traverse, stabpusher and coiler exceeds 6,000.

Orders have been received for twelve amplidyne electrode regulators for arc furnaces and one of these was for an equipment for a 60 ton furnace, the largest of its kind to be built in Great Britain. Two 1,800 ft/min coil preparation lines were put into service at the Trostre works of the Steel Co. of Wales. The electrical equipment for each line includes motors totalling 300 h.p., together with their associated m.g. sets, regulating amplidyne sets and various controls.

Orders were received from Ransomes & Rapier for the complete electrical equipment for two large walking draglines, one of which will be essentially a duplicate of the one at Corby of Stewarts & Lloyds.

A steady demand continued for " Stacreep " control equipments for use on cranes, etc. Jessop & Co. of Calcutta ordered electrical equipment for 23 three-ton dockside cranes and seven six-ton cranes, all of which will have variable speed three-phase commutator motors on the hoist motions.

The company has long advocated " closed-loop " control for Ward-Leonard winders for mines, and 1952 saw the principle generally accepted, the scheme being used in the design for two winder equipments for Hem Heath Colliery near Stoke.

Lighting schemes employing " Mazda " lamps and fittings were completed in some of the country's largest industrial establishments. At Thames Haven and at Shell Haven oil tankers received a brighter and more rapid service as the result of fluorescent flameproof lighting installations on the jetties. At the new Trostre works of the Steel Co. of Wales more than 725 kW of lighting load was created by 314 blended-light fittings. More than 11,700ft of universal fluorescent lighting trunking was installed over the two factory areas of Tootal Broadhurst, St. Helens, enabling the lighting to be directed along entire lines of machinery.

Associated British Oil Engines (Marine), Ltd.

This company reports excellent business during the year on behalf of the associate companies in the Brush Aboe group, who received orders for main propulsion and auxiliary sets from the principal shipbuilders in the United Kingdom, including Hawthorn Leslie, Harland & Wolff, Burntisland Shipbuilding Co., and Cammell Laird, etc. A few of the developments with the more electrical aspects are given below.

The National Gas & Oil Engine Co., Ltd., received orders for 21 auxiliary sets with National M4A type engines, 70 sets with R4A engines and 12 sets with F4A engines, representing a power range of from 50 to 700 h.p., all the engines being coupled to generators of 30 to 400 kW; a repeat of the machinery supplied for the Mersey Docks diesel-electric pilot vessel, the *Sir Thomas Brocklebank*, the propulsion machinery of which comprises two F4AU6 engines, each of 850 h.p. and coupled to a 375 kW main generator and an 80 kW auxiliary generator, and a 40 kW auxiliary engine-driven generator set.

Mirrlees, Bickerton & Day, Ltd., received orders for twelve J6 engines coupled to 200 kW generators for the Anglo-Saxon Petroleum Co.'s new tankers; six J5 auxiliary sets; and one J6 auxiliary set for a trawler under construction by Cook, Welton & Gemmell, Ltd.

Orders received by J. & H. McLaren, Ltd., for M type engines, ranging in size from two to eight cylinders, include 25 auxiliary sets of from 50 to 176 h.p., coupled to 25 to 80 kW generators, which are being supplied to shipbuilders in the U.K., Australia, Malaya, Iceland and Portugal.

Steel Bill Protest

Position of "Private" Foundries

LAST week representatives of the trade associations concerned met the Minister of Supply (Mr. Duncan Sandys) in an endeavour to clarify the position of "private" foundries under the Iron and Steel Bill. As the Bill stood, the departments of engineering firms dealing with casting, forging and rolling were placed under the supervision of the proposed Iron and Steel Board.

This was the subject of a protest in November last from leading representatives of the engineering industries, including the chairman of the B.E.A.M.A. Council (Mr. T. F. Lister) and the president of the British Engineers' Association (Mr. D. D. Walker), which called for the removal of the offending provisions of the Bill. (See *Electrical Review*, 28th November, pp. 1152 and 1182.)

It has been reported that the British Iron and Steel Federation, the Joint Iron Council, the Council of Iron Producers and the Council of Ironfoundry Associations were in favour of the supervision of the foundries of engineering concerns by the new Board while the British Steel Founders' Association was against it.

Minister's Explanation

At last week's meeting the Minister insisted that the Board must have some powers of supervision but promised to amend the Bill to ensure that the powers were limited to those necessary for the carrying out of its duties and to prevent any unnecessary interference with the operation of private foundries. He contended that the inclusion of these foundries was necessary to ensure to them a fair share of the available materials. The Government would consider methods of restricting the Board's field of price control. Mr. Sandys said that the Board's control of development of private foundries would only apply in cases which might affect the balance of the iron and steel industry—which he thought was a very unlikely contingency. The Minister also mentioned the need for meeting the views of the trade unions in framing the Bill.

In view of the Minister's insistence that there could be no general deletion of the Board's proposed powers over private foundries and his promise to introduce amendments the meeting agreed to withdraw opposition to the Bill.

Last week-end the Government published its amendments to the Bill, designed to implement Mr. Sandys' promises. It is made clear that with regard to rolling and forging (as mentioned in the Third Schedule) it is not the intention that the Iron and Steel Board should supervise essentially engineering processes. Owners of foundries in the engineering industry will not now be required to submit their development schemes to the Board for approval.

The Board's powers to fix maximum prices of castings and forgings will apply only where monopoly conditions or restrictive practices exist and the Board has been unable to secure reasonable prices voluntarily. The Board will be able to vary its maximum prices in cases where abnormal requirements of customers involve extra costs to the producers.

Where the Board is satisfied after consultation with the employers and trade union representatives that working conditions in any particular foundry belonging to an engineering works are satisfactorily dealt with, it will not intervene in these matters.

The extent of general supervision by the Board is limited by other amendments which, generally, ensure that information can be called for only within the Board's price-fixing powers. Contributions towards the Board's costs will be based only on the iron and steel activities of an engineering concern—not on its whole business.

B.E.A.M.A. Contract Price Formulæ

THE British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 17th January is deemed to be 141s 6d. The "cost of material" figures are as follows:—

For electrical machinery and equipment: the Board of Trade index figure published on 17th January is 162·7.

For turbo-generating and allied plant: materials used in mechanical engineering industries, 148·9; blast furnaces and iron and steel smelting and rolling (40 and 41), 142·4; price of ⅜in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 16th January), 3s 11¼d.

Outstanding contracts covered by the Board of Trade intermediate products index: The index figure for intermediate products (17th January) is 365·4.

Measuring Instrument Manufacturers

THE annual luncheon of the British Industrial Measuring and Control Apparatus Manufacturers' Association (B.I.M.C.A.M.) was held at Brown's Hotel, London, on 13th January. Mr. E. B. Moss, president of the Society of Instrument Technology, in proposing the toast of the Association, referred to the way in which large sums could be saved by the provision of instructional literature of a high standard. These instructions, supplied by instrument manufacturers, dealt with the installation, maintenance and servicing of their equipment, and great attention was paid to this point in the United States.

Mr. L. S. Yoxall, chairman of the Association, expressed disappointment with the terms of the £1 million scheme for Government loans to industry to increase fuel efficiency. It was common knowledge that measuring instruments would ensure greater economy than almost any other type of equipment. Despite this, measuring and control apparatus had not been included in the Government list of equipment qualifying for the loans. In addition, he said, the amount of the loans envisaged was inadequate.

Mr. W. G. Ardley, president, proposed the toast of the guests and welcomed new members of the Association. The twenty-seven firms now in the Association represented more than 90 per cent of the productive capacity of the industrial instrument industry in Great Britain. Sir Charles Ellis, member of the National Coal Board, who replied, said the Association could be proud of the way in which it had grappled with changing events. The rapidity with which the research instrument was made into a production instrument was a remarkable achievement.

F.B.I. Overseas Scholarships

THE arrival in London last week of four young graduate engineers from Australia marks a new development in the progress of the F.B.I. overseas scholarships scheme. Through this scheme, which is a long-term plan for British exports, it is hoped eventually to train every year in British engineering works from 150 to 250 selected graduates from developing countries overseas. The four Australian engineers will be followed in the next few weeks by seven others who have also been recommended for F.B.I. scholarships by special selection committees in Australia. The first four are Mr. M. S. Gregory, a civil engineer from Tasmania, who is to receive training with Sir Alexander Gibb & Partners; Mr. I. Buchan, an electrical and mechanical engineer (New South Wales), who is going to the Fairey Aviation Co., Ltd.; Mr. G. J. Campbell, an electrical and mechanical engineer (Victoria), who is going to the Fraser & Chalmers Works, Erith, Kent, and Mr. R. H. Casling (South Australia), who is going to Glenfield & Kennedy, Ltd. Another arrival was an engineering graduate from India, Mr. L. S. Srinath; three other engineers from India are to arrive very shortly.

On the recommendation of the F.B.I. Engineering Training Mission to Latin America, 50 scholarships have been offered to the principal Latin American republics, and recommendations are now being considered. All graduates will normally receive two years' practical training in Great Britain. Training and maintenance expenses will be defrayed by British industry, aided by a grant from the Government and, in some cases, by the overseas Government concerned.

Dow Prize Competition

LAST year the Illuminating Engineering Society announced that in memory of the late Mr. J. S. Dow a biennial competition would be held to encourage collaboration between students of illuminating engineering or those branches of engineering concerned with lighting and students in other fields in which lighting plays an important part, the prize being a cash award of £75. The first competition was intended to encourage collaboration between engineers and architects and took the form of the layout, artificial lighting and decoration of a ground floor showroom of a provincial shop selling sports goods. In all the arrangements for the competition the I.E.S. had the co-operation of the Royal Institute of British Architects and the Institution of Electrical Engineers.

Twenty-six entries were received for the first competition, nearly all being from teams of engineers and architects. The members of the winning team were Mr. W. D. Tyrrell, Croydon Polytechnic (illuminating engineer), Mr. T. A. D. Bindon, S.E. London Technical College (electrical engineer), Mr. E. W. Uglow, Miss S. M. Gray, Mr. C. G. Crowfoot and Mr. R. G. Smith. The last four are all at the Regent Street Polytechnic and are architects. Highly commended by the assessors was an entry from South Africa.

The entries for the competition will be on view at a special meeting of the I.E.S. at 6 p.m. on 25th February, at the Lighting Service Bureau, 2, Savoy Hill, W.C.2. At this meeting (at which the awards will be presented) the assessors for the competition, Mr. R. O. Ackerley and the Hon. Lionel Brett, M.A., A.R.I.B.A., will discuss the entries. The I.E.S. invites all who are interested to be present.

PROMISING AFRICAN MARKETS

Increased Electrical Import Trade

ELECTRICAL imports into East Africa progressed substantially between 1950 and 1951. All the important groups advanced, with cables and telegraph and telephone materials outstanding. Increases in the trade of Tanganyika were less marked than in Kenya or Uganda, but they were for the most part double the values of five years ago. The United Kingdom remained predominant in the majority of lines although other parts of the Commonwealth competed in a minor way. Germany regained some business in portable tools and appliances and small household devices although supplies were mainly from the United Kingdom. The table shows increases or decreases between 1950 and 1951 in the principal lines in each of the three sections of the territory.

Delays arising from various unforeseen difficulties have hindered both full development at Wanjii and the completion of the Tana power station. Consequently shortage of supply for Nairobi and district seems likely to persist for a month or two yet. Long term electric power prospects are good. An additional 8,000 kW hydro-electric scheme (Low Tana) is being started, and another (Seven Forks), of 80,000 kW eventually, is planned. Increasing demand for electricity at Dar-es-Salaam has been met by the installation of oil-driven units.

CLASS OF GOODS	KENYA		UGANDA		TANGANYIKA	
	1951 £ (000)	Inc. or dec. on 1950 £ (000)	1951 £ (000)	Inc. or dec. on 1950 £ (000)	1951 £ (000)	Inc. or dec. on 1950 £ (000)
Generators, motors, convertors and transformers	270	+113	132	+ 21	117	−124
From U.K.	214	+ 82	125	+ 16	98	−127
„ U.S.A.	26	+ 23	1	− 1	13	− 11
Batteries and accumulators for motor vehicles	130	+ 22	59	+ 29	66	+ 8
From U.K.	121	+ 29	55	+ 27	65	+ 15
„ South Africa	1	− 3	—	− 1	1	− 4
Lamp and torch batteries	45	− 17	23	+ 13	29	+ 16
From U.K.	—	—	1	− 1	1	− 1
„ Malaya	28	+ 14	12	+ 8	18	+ 9
„ South Africa	16	+ 3	9	+ 6	10	+ 3
Other batteries and accumulators	24	+ 18	2	+ 1	9	+ 6
From U.K.	15	+ 11	1	+ 1	4	+ 2
„ South Africa	3	+ 2	—	—	3	+ 3
Bulbs and tubes for lighting, domestic	32	+ 15	10	+ 5	18	+ 8
From U.K.	16	+ 7	6	+ 2	10	+ 4
„ Holland	15	+ 8	3	+ 2	7	+ 4
Ditto for torches and hand-lamps	6	+ 3	3	+ 1	4	+ 2
From U.K.	3	—	2	—	2	—
Radio receiving sets, domestic	89	+ 34	42	+ 19	54	+ 20
From U.K.	44	+ 17	21	+ 11	28	+ 9
„ Holland	40	+ 15	17	+ 4	22	+ 6
Ditto, other, and spares	55	− 35	6	− 2	18	—
From U.K.	46	− 40	5	− 2	16	—
„ Holland	4	+ 3	1	− 1	1	—
Telegraph and telephone instruments and apparatus	412*	+147	27*	+ 7	55*	− 8
Insulated cables and wires	522	+200	293	+ 84	175	+ 47
From U.K.	493	+212	289	+ 32	150	+ 30
„ South Africa	28	− 3	3	+ 3	25	+ 18
Portable tools and appliances and small household electrical devices not over 15 kg.	43*	+ 20	14*	+ 7	27*	+ 11
Electrical appliances for motor vehicles, cycles and i.c. engines	96	+ 60	54	+ 23	28	+ 7
From U.K.	52	+ 32	30	+ 7	17	+ 1
„ Canada	6	+ 5	—	− 1	—	− 1
„ Australia	5	+ 3	—	—	—	—
„ U.S.A.	7	+ 2	—	—	2	—
Torches complete or excluding batteries and bulbs	18	− 2	11	+ 3	13	+ 4
From U.K.	1	+ 1	1	—	1	—
„ Hongkong	16	− 3	10	+ 3	11	+ 2
Other appliances and apparatus	143	− 54	106	+ 41	59	+ 9
Parts and accessories, unspecified	146	+ 15	88	+ 18	61	− 15

* Mainly from U.K.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Radio and Television Relay Merger.—Philip Hill, Higginson & Co., Ltd., announces that plans are in hand for the integration of the radio and television relay businesses now carried on separately by the British Relay Wireless Group and the Link Sound and Vision Services Group. Application is being made to the Capital Issues Committee for permission to form a holding company with an issued capital as follows :—6½ per cent unsecured loan stock 1960/67, £400,000; "A" ordinary shares of 5s each, £300,000; "B" ordinary shares of 5s each, £175,000. This company will acquire the share capital of the companies in the two groups. Major G. H. Martin, who has been in charge of the operations of the British Relay Wireless Group since 1945, will, it is intended, be managing director of the new company. The whole of the "B" ordinary share capital will be taken up by Pye, Ltd., and Murphy Radio, Ltd., and companies associated with them. Arrangements for the issue of the unsecured loan stock, at par, and the "A" ordinary shares, at a price of 10s per 5s share, are nearing completion. It is intended to seek quotations for the unsecured loan stock and the "A" ordinary shares on the Stock Exchange, London, in June.

R. A. Lister & Co., Ltd., report a group profit, subject to audit, for the year ended 30th September last of £677,073, as compared with £627,972 for the preceding year. Taxation requires £399,057, and the profit attributable to the parent company is £274,936 (against £233,746). It is proposed to pay a final ordinary dividend of 6½ per cent, maintaining the distribution for the year at 9 per cent.

The Rangoon Electric Tramway & Supply Co., Ltd., reports a net profit for 1952, after Burmese tax of £142,253, of £99,635, as compared with £44,779 for 1951. General reserve receives £20,000, and it is proposed to pay an ordinary dividend of 50 pyas per share, free of Burmese tax. This is the first ordinary distribution since the interim of R¼ per share in respect of 1941. The balance carried forward is £22,258 (against £26,248 brought in).

L. Sterne & Co., Ltd., report a net profit for the year ended 31st October last of £94,327, as compared with £91,220 for the preceding year. Taxation absorbed £109,000. General reserve receives £70,000 and the dividend for the year is unchanged at 15 per cent. The balance carried forward is £69,828 (against £69,599 brought in).

Hackbridge Cable Holdings, Ltd., has declared an interim dividend of 7½ per cent (unchanged).

The Globe Telegraph & Trust Co., Ltd., announces an interim dividend of 3 per cent (same).

New Companies

X-Ray Rentals, Ltd.—Registered 3rd January. Capital £5,000. Hirers of electrical and mechanical equipment, etc. Directors : E. G. Roman and R. E. Hartridge. Regd. office : 113, Victoria Street, St. Albans, Herts.

L. G. Maslen, Ltd.—Registered 5th January. Capital £500. To acquire the business of a retailer of electrical goods and electrical contractor carried on by L. G. Maslen, at 4, London Road, Hockerill, Bishops Stortford. Directors : L. G. Maslen and D. V. Castle. Regd. office : 4, London Road, Bishops Stortford.

Le Klint (London), Ltd.—Registered 8th January. Capital £120. Manufacturers of and dealers in lampshades, electrical and gas fittings, lights, electrical flexes, etc. Directors : P. E. Stemann and Mrs. Gwen Stemann. Regd. office : 14, Holbein Place, S.W.1.

Frank Ross & Partners, Ltd.—Registered 8th January. Capital £5,000. Electricians, mechanical engineers, manufacturers of and dealers in electrical apparatus and goods, etc. Directors : F. J. Ross, L. E. Luck, C. Snape, A. H. Lacey and A. C. Warneford. Regd. office : 1, Gore Road, New Milton, Hants.

Increases of Capital

Gresham Transformers, Ltd.—Increased by £42,000, in £1 ordinary shares, beyond the registered capital of £8,000.

Morley Electrical Engineering Co., Ltd.—Increased by £20,000, in £1 ordinary shares, beyond the registered capital of £5,000.

William Oakley, Ltd.—Increased by £48,000, in £1 ordinary shares, beyond the registered capital of £2,000.

W. T. Henley's Telegraph Works Co., Ltd.—Increased by £2,450,000, in 5s ordinary shares, beyond the registered capital of £2,650,000.

British Thermostat Co., Ltd.—Increased by £350,000, in 5s ordinary shares, beyond the registered capital of £300,000.

Liquidation

Welwyn Electricity Installations, Ltd.—Members' voluntary winding-up. Meeting of members on 12th March at Wigmores North, Welwyn Garden City, Herts, to receive an account of the winding-up by the liquidator, Mr. J. F. Eccles.

Bankruptcies

G. Towell, trading as Stafford Radio, 183a, Grange Road, Birkenhead, electrician.—Receiving order made 5th January on a creditor's petition. First meeting held 22nd January. Public examination 18th February at Court House, Pilgrim Street, Birkenhead.

D. Cromwell and **V. I. Cromwell,** carrying on business in partnership under the style of Cromwell & Co., at the rear of 76, High Street, Croydon, Surrey, and formerly at Hindsley Works, Hindsley Place, Forest Hill, London, S.E.23, and 17, Streatham Hill, London, S.W.2, and at a garage in Coombe Avenue, Croydon, Surrey, manufacturers of electrical fittings, lampshades and a food product. (Joint estate).—Last day for receiving proofs for dividend 24th January. Trustee, Mr. L. C. E. Webber, 32, Queen Anne Sreet, Cavendish Square, London, W.1.

F. L. Napier, carrying on business at 5, School Road, Sale, Ches, as an electrical contractor.—Receiving order made 12th January on debtor's own petition.

B. F. Robbings, lately carrying on business at 1388, Greenford Road, Greenford Green, Middx, under the style of "Electric House," and at 81b, Northolt Road, South Harrow, under the style of "Radio and Electric House," radio and electrical retailer.—Order made 12th December suspending discharge for three months until 12th March.

C. L. Philpott, 55, High Street, Walton-on-Naze, Essex, radio and electrical dealer.—First and final dividend of 5s 7d in the £, payable on and after 17th February at the office of the trustee, Walter House, 418-422, Strand, London, W.C.2.

W. E. J. Hardy, 53, Deodar Road, Putney, London, S.W.15, lately carrying on business at 187, Putney Bridge Road, Putney, S.W.15, electrical engineer and contractor.—Receiving order made 8th January on a creditor's petition.

S. Green, 373, Bolton Road, Darwen, Lancs, electrical contractor.—Last day for receiving proofs for dividend 27th January. Trustee, Mr. F. C. Ormrod, 20, Byrom Street, Manchester, 3. Official Receiver.

S. Edmondson, electrical dealer and contractor, carrying on business at Main Street, Milnthorpe, Westmorland, under the style of E. & B. Radio.—Last day for receiving proofs for dividend 27th January. Trustee, Mr. L. H. Shipton, 31, Lloyd Street, Manchester, 2.

J. Hilbert, 17, Manchester Road, Haslingden, Rossendale, Lancs, radio and electrical engineer.—First and final dividend of 2d in the £, payable on and after 23rd January at the office of the trustee, 47, Mosley Street, Manchester, 2.

The Canadian Outlook

IN a New Year comment Mr. H. M. Turner (president, Canadian General Electric Co.) states that in the Canadian electrical industry, as elsewhere, projects are being planned for a decade or more ahead, based on intensive use of economic research and market analysis. In addition, there has been a sharp expansion in distribution facilities, apart from the increasing of production, which will speed products to widening markets, both here and abroad. The spotlight of world interest focused on Canada had brought with it intensive competition from all of the highly industrialized nations. As a nation, they were seriously undermanned and they must supplement their human resources by a continuing high level of immigration and by the intensive application of power and machinery.

Production in the electrical industry was now in general balance, serving not only the needs of defence and the producer but the consumer as well. During 1952, almost 2,000,000 h.p. was added to the nation's generating capacity. In the defence programme, there had been a significant contribution in radar, communication equipment and in electronic control equipment of a wide variety for aircraft, guided missiles and naval ships. Production in the Canadian electrical manufacturing industry as a whole was estimated at almost $750,000,000 and employment at over 70,000 in 1952. For the coming months, the general prospect was for continuing high rates of production and employment, with prices continuing to level off.

The appliance industry continued to carry the burden of special excise taxes as one of the remaining elements in the Government's intensive anti-inflation programme of a year ago. Since the reasons for this programme had now largely disappeared, it was expected by many that these taxes on small appliances, radio and television receivers would soon be removed entirely.

STOCKS and SHARES

IN most sections of the Stock Exchange prices remain distinctly firm under the influence of a moderate but steady volume of new investment. British Electricity stocks have mostly gained further fractions, and electrical equipment shares account for a number of the favourable price changes in the industrial market, which was cheered in particular by a good Woolworth dividend. Johnson & Phillips ordinary have been in demand up to 53s 9d, and C. A. Parsons are 2s 6d up at 57s 6d. In the telephone group, Ericssons, Automatic Telephones and Telephone Manufacturing have all advanced. Improvements are shown, amongst others, by W. H. Allen, Enfield Cables, Ever Ready, Siemens, London Electric Wire, and Tube Investments. Falk, Stadelmann have been marked up belatedly in the Stock Exchange Official List to 42s, but Dewhurst & Partner shares are still shown there at 5s, although bargains have been recorded up to 5s 9d.

Henley's Bonus

W. T. Henley's Telegraph ordinary stock is quoted now in units of 10s, instead of 5s previously, as a sequel to the distribution of the 100 per cent share bonus. This has been effected by the issue of one new 5s share for every 5s unit previously held, and by the subsequent consolidation of the two into 10s stock units. There is therefore no change, on that account, in the quotation which, however, has risen 6d to 19s in the ordinary course of business. Total issued ordinary capital will now amount to £4,875,000, which is much more appropriate to the substance of the company's assets. Stockholders are advised that the bonus carries no implication, in itself, of any increase in the amount to be distributed in dividends. Calculations have accordingly to be based on half last year's rate of dividend. At 19s the 10s units would yield 5¼ per cent on a 10 per cent payment.

Pye Developments

Several items of news have contributed to the improvement of 9d in the price of Pye 5s deferred shares, now 16s 6d, over the past week. One announced the company's re-entry into the field of home electrical appliances for the first time since the war. Earlier, there was news of the plan to develop further, in conjunction with Murphy Radio, the radio and television rediffusion services of these two companies. Another matter concerning Pye was the monthly retail trade report on radio and television sets, sales of the latter having risen in November to the best figures for the year. On the basis of last year's 18 per cent dividend, which was followed by a small capital bonus, the yield on the shares is £5 7s 6d per cent.

Cover for Dividends

The " earnings cover " for a dividend is one of those phrases very familiar to people initiated in Stock Exchange affairs, but receiving less attention than it deserves on the part of some others. It will be recurring constantly in financial comments over the next few months as company dividend and profits statements for 1952 begin to flow in, and a brief note on the subject may not be out of place at this stage. Briefly, it compares the net amount (after tax) paid out in ordinary dividend, with the surplus of profits actually available for distribution, after deduction of all ordinary expenses and depreciation, taxation, and the dividends on debentures, preference stocks and other fixed charges. The difference between the two is, of course, the amount of profits ploughed back into the business. It measures the extent to which the company concerned is being conservative or otherwise in its dividend policy. The result is a considerable factor in the valuation and assessment of the company's shares.

Dividends Declared

The Lindley Thompson Transformer Company's declaration of an ordinary dividend of 12½ per cent, in respect of the year ended last September, conforms with the estimate made in the prospectus issued about fifteen months ago in connection with the marketing of the shares. The 1s ordinary have changed hands lately at a little above their par value. Hackbridge Cable Holding's interim dividend of 7½ per cent is at the same rate as for last year, in respect of which the final, declared in August, brought up the total to 20 per cent. At the September meeting, the chairman reported a very good volume of work on hand and in prospect. The current year, which ends in March, had begun favourably with a further increase in the money value of the turnover, and he hoped to be able to present next time a statement of continued progress.

Stock on Offer

Among the electrical shares on offer lately in fair numbers are Brook Motors 10s ordinary at 33s 6d, to yield nearly 6 per cent on the well-covered 20 per cent dividend; and Hackbridge & Hewittic 5s shares at 16s 9d, the return being the same. Lancashire Dynamos at 44s and Reliance Clifton 5s shares at 26s 6d show yields of a little under 5¾ per cent, which is the indicated return also on Telegraph Constructions at 26s 6d (assuming a 7½ per cent payment). Engineering & Lighting 2s shares have been on offer at just over par, giving a prospective 9¾ per cent on the money.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 19th Jan. 1953	Week's Rise or Fall	Est. Yield p.c. £	s	d
Gilt-edged and Overseas Stocks							
Brit. Elec. 1968/73	3	3	85	+½	3	10	7
Brit. Elec. 1974/77	3	3	83	−½	3	12	3
Brit. Elec. 1976/79	3½	3½	89½	+½	3	18	3
Brit. Elec. 1974/79	—	4½	100½	+½	4	4	6
Calcutta Elec. ..	6†	6†	20/-	—	6	0	0†
East African Power	7	7	23/-	—	6	1	9
Nigerian Elec. ..	10	10	21/3	—		—	
Palestine Elec. "A"	5†	Nil	9/-	—		—	
Perak Hydro-Elec.	Nil	Nil	14/6	—		Nil	
Equipment and Manufacturing							
AberdareCables(5/-)	20	20	15/3	—	6	11	2
Aerialite (1/-) ..	83½	88½	8/6	—	10	7	9
Allen, W. H. ..	15	15	43/-xd	+1/9		—	
Aron Elec. Ord. ..	15	15	37/6	—	8	0	0
Assoc. Elec. Ord. ..	20	20	76/3	—	5	5	0
Automatic Tel. & El.	15	15	61/3	+1/6	4	18	0
Babcock & Wilcox	18	18	71/3	+9d	5	1	1
Baldwin, H. J. (2/-)	25	20	3/6	—	11	8	9
Bakelite (10/-) ..	—	—	16/3	—		—	
British Aluminium	10	12	42/-	−1/6	5	14	3
B.I. Callender's ..	7½	9	34/-	—	5	6	0
British Thermostat (5/-)	30	30	28/9	—	5	4	3
British Vac. Cleaner (5/-)	25	25	13/6	—	9	5	2
Brook Motors (10/-)	20	20	32/6	—	6	3	1
Brush Ord. (5/-) ..	10	10	5/-	—	10	0	0
A. F. Bulgin (1/-)..	27½	30	2/7½	—	11	8	6
Burco (5/-) ..	38½	35	18/9	—	9	6	9
Chloride El. Storage	15	15	65/-	—	4	12	4
Cole, E. K. (5/-) ..	25	25*	17/6	+6d	7	2	10
Cossor, A. C. (5/-)	Nil	10	9/9	+3d	5	2	7
Crabtree (10/-) ..	17½	17½	31/3	—	5	12	0
Crompton Parkinson Ord. (5/-) ..	11½	11½	8/9	—	6	8	6
De La Rue (5/-) ..	50	35*	8/-	−6d		—	
Decca (1/-) ..	112½	112½	18/-	—	6	5	0
Dewhurst (2/-) ..	22½	19*	5/-	—	7	12	0
Dictograph Tel. (2/-)	20	20	5/-	—	8	0	0
E.M.I. (10/-) ..	12	12	13/6	−6d	8	17	9
Electrical Components (5/-) ..	20	20	10/-	—	10	0	0
Elec. Construction	15	15	53/9	—	5	11	6
Enfield Cable Ord.	7½	7½	24/-	+2/-	6	5	0
English Electric ..	15	15	58/9	—	5	2	3
Ericsson Tel. (5/-)	22†	22*†	42/6	+1/-	2	11	9†
Ever Ready (5/-)..	35	35	27/3	+1/-	6	8	5
Falk Stadelmann..	15	15	42/-	+3/3	7	2	10
G.E.C. Ord. ..	22½	22½	42/-	—	5	7	2*
General Cables (5/-)	30	30	15/-	—	10	0	0
Greenwood & Batley	15	15	38/-xd	+6d	7	18	0
Hackbridge Cable (5/-)	20	20	10/3	—	9	15	0
Hackbridge Hewittic (5/-)	18	20	16/3	—	6	3	0
Hall Tel. Acc. (10/-)	10	10	9/3	—	10	16	2
Heatrae (2/-) ..	12½	12½	4/-	—	6	5	0
Henleys (10/-) ..	20	20	19/-	+6d	5	5	3*
Holophane (5/-) ..	15	20*	11/3	—	8	17	10
Hoover (5/-) ..	37½	35*	24/6	+1/6	7	2	9

Company	Dividend Previous	Dividend Last	Middle Price 19th Jan. 1953	Week's Rise or Fall	Est. Yield p.c. £	s	d
Equipment and Manufacturing (continued)							
Intl. Combustion (5/-)	20	25	12/6	—		—	
Johnson & Phillips	15	15	53/9	+1/9	5	11	6
Lancashire Dynamo	22½	12½*	42/6	—	5	17	8
Laurence,Scott(5/-)	12½	15	13/3	—	5	13	3
London Elec. Wire	12½	12½	52/6	+1/6	4	15	3
J. Lucas	7½	9½	36/3	—	5	1	3
Marryat & S. (2/-)	22½	22½	5/-	—*	9	0	0
Mather & Platt ..	12½	12½	42/6	+1/6	5	19	7
Metal Industries ..	10	15	41/9	+6d		—	
Mid. Elec. Mfg. ..	15	15	55/-	—	5	9	1
Murex	12½	15	55/-	−3d	5	9	0
Newman Ind. (2/-)	6	10	2/3	—	8	17	10
Oldham & Son (1/-)	30	35	2/6	—		—	
Parnall (Yate) (5/-)	6	6	3/6	—	8	11	6
Parsons, C. A. ..	15	10*	57/6	+⅛		—	
Plessey (5/-) ..	22½	25	21/3	—	5	17	9
Pye Deferred (5/-)	18	18	16/6	+9d	5	9	1
Revo (10/-) ..	27½	27½	42/6	—	6	9	6
Reyrolle	15	10*	51/3	—		—	
Scot. Cable (4/-) ..	30	32	11/3	—		—	
Siemens Ord. ..	10	10	36/-	+1/6	5	11	0
Strand Elec. (5/-)..	17½	17½	8/9	—	10	0	0
Sturtevant (5/-) ..	16¾†	17¼*†	24/6	—		—	
Switchgear&Cowans (5/-)	22½	22½	15/6	—	7	5	3
Taylor T. (5/-) ..	20	20	19/3	—	5	4	0
T.C.C. (10/-) ..	20	20*	38/-	—		—	
T.C. & M... ..	10	10	26/-	—		—	
TelephoneMfg.(5/-)	10	10	8/6	+6d		—	
Thorn. Elec. (5/-)..	10	12½	7/9	−3d	8	1	4
Tube Investments	25	15*	61/3	+1/-	4	18	0
Vactric (5/-) ..	Nil	Nil	4/6	—		Nil	
Veritys (5/-) ..	Nil	7½	4/9	—	7	18	0
Walsall Conduits (4/-)	70	70	46/-	—		—	
Ward & Goldstone (5/-)	45	45*	30/-	—		—	
Watford (2/-) ..	25	25	7/-	+3d	7	2	10
Westinghouse Brake	14	14	52/6	+6d	5	6	8
West, Allen (5/-) ..	12½	15	10/3	—	7	6	4
Trusts, Transport and Communications							
Anglo-Am. Tel.: A Ord. ..	—	6	79½	—	7	11	0
Ord.	—	3¾	55	—	6	16	3
Anglo-Portuguese	8	8	20/6	—	7	16	1
Brit.Elec.Traction: Def. Ord. ..	22½	25	435	+10	5	12	0
Cable & Wireless: Ord.	6	8	127½	—	6	5	6
4% Loan ..	4	4	94½	—	4	4	9
Calcutta Trams ..	6†	6†	22/-	—	5	9	1†
Cape Elec. Trams	5	5½	10/-	—	11	0	0
Marconi Marine ..	10	10	31/3	+9d	6	8	0
Oriental Tel. Ord.	16	16	60/-	+6d		—	
Telephone Props...	8	8	33/9	+⅛	4	14	10
Tele. Rentals (5/-)	10	10	8/9	+3d	5	14	3

* After capital bonus.
† Dividends are paid free of Income Tax.

NEXT WEEK'S EVENTS

Monday, 26th January

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Radio Group. "Electronic Telephone Exchanges," by T. H. Flowers. (Joint meeting with the Birmingham Centre of the Institution of Post Office Electrical Engineers.)

BRISTOL.—Electricity House, Colston Avenue, 6 p.m. I.E.E. Western Utilization Group. "Electricity in Newspaper Printing," by A. T. Robertson.

GLASGOW.—39, Elmbank Crescent, 7.15 p.m. Institution of Works Managers, Glasgow Branch. "Factory Insurance," by C. Kelly.

LEEDS.—24, Aire Street, 6.15 p.m. I.E.S. Leeds Centre. "The Physical Principles Governing Fittings Design," by W. H. Willott.

The University, 7.30 p.m. Incorporated Plant Engineers, West & East Yorks Branch. "Basic Principles of Lubrication": film.

LEICESTER.—Demonstration Theatre of E.M.E.B. at 6.30 p.m. I.E.S. Leicester Centre. "Automobile Lighting," by K. J. Jones.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Radio Section. Discussion on "The Relative Merits of Harmonic and Inter-modulation Measurements for Assessing Distortion in Audio Equipment," opened by E. W. Berth-Jones.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "The Design of High-Speed Salient-Pole A.C. Generators for Water-Power Plants," by E. M. Johnson and C. P. Holder.

Tuesday, 27th January

BRISTOL.—Colston Hall, 6.30 p.m. I.E.E. Western Centre. Faraday Lecture. "Light from the Dark Ages, or the Evolution of Electricity Supply," by A. R. Cooper.

CARDIFF.—Demonstration Theatre, S.W.E.B., 5.45 p.m. I.E.S. Cardiff Centre. "Stage Lighting," by L. G. Applebee.

GREAT MALVERN.—Winter Gardens Restaurant, 7.15 p.m. I.E.E. South Midland Centre district meeting. "Colour Television," by L. C. Jesty.

LEEDS.—College of Technology, 6.30 p.m. I.E.E. North Midland Centre Education Discussion Circle. Discussion on "Lighting and Illumination in Electrical Engineering Courses," opened by Dr. E. C. Walton.

LIVERPOOL.—Service Centre, Whitechapel, 6 p.m. I.E.S. Liverpool Centre. "Black Light, its Effect and Application," by H. L. Privett. (Joint meeting with Incorporated Plant Engineers.)

LONDON.—At the Institution of Electrical Engineers, Savoy Place, W.C.2, 5 p.m. Institution of Post Office Electrical Engineers, London Centre. "Coaxial Cables—Some Practical Aspects of their Design and Maintenance," by G. E. Rossiter.

Manson House, Portland Place, W.1, 7 p.m. Society of Instrument Technology. "Instrumentation in the Paper Making Industry," by F. W. Hayward.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Measurements Group. Address on "Electrical Measurements and Chemistry," by Dr. L. Hartshorn, chairman of the Measurements Section.

WOLVERHAMPTON.—Technical College, Wulfruna Street, 7.15 p.m. British Institution of Radio Engineers, West Midland Section. "The Search for Bandwidth Economy in Television," by D. A. Bell.

Star and Garter Royal Hotel, 7 p.m. Institution of Works Managers, Wolverhampton Branch. "Material Handling."

Tuesday, 27th January, to Thursday, 29th January

LONDON.—Horticultural Hall, Westminster, S.W.1. Amusement Trades Exhibition.

Wednesday, 28th January

FARNBOROUGH.—R.A.E. Technical College, 7.30 p.m. I.E.E. Southern Centre. "Radio Navigation of Aircraft and Ships," by C. Williams.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Supply Section. "Some Researches on Circuit Breaking by Means of High-Voltage Circuit Breakers with Special Reference to Current-Chopping," by A. F. B. Young.

Café Royal, 6.45 for 7.15 p.m. I.E.E. Radio Section. Section dinner-dance.

I.E.E. London Students' Section, 2 p.m. Visit to Johnson & Phillips, Ltd., Charlton, S.E.7.

Grosvenor House, Park Lane, W.1. Electrical Contractors' Association. Annual dinner.

At the Royal Institution, Albemarle Street, W.1, 6 p.m. Illuminating Engineering Society. Trotter-Paterson Memorial Lecture. "The Nervous Reactions of the Retina," by Dr. E. D. Adrian.

MANCHESTER.—Engineers' Club, Albert Square, 6.30 p.m. Women's Engineering Society, Manchester Branch. "The Projection of Microscopic Structures," by W. J. Garnett.

STAFFORD.—English Electric Co.'s Lecture Theatre, 7 p.m. I.E.E. North Staffs Sub-Centre, Students' Section. "Some Tests on Large High Speed Turbo-Alternators," by J. P. Harbord.

SWANSEA.—Y.M.C.A., 6 p.m. I.E.S. Swansea Group. "Coloured and Directional Light as Applied to the Stage," by L. G. Applebee.

TORQUAY.—Electric Hall, 3 p.m. I.E.E. South-Western Sub-Centre. "Electricity in Farm Crop-Drying," by C. A. Cameron Brown and P. G. Finn-Kelcey.

Thursday, 29th January

BRADFORD.—45–53, Sunbridge Road, 7.30 p.m. I.E.S. Bradford Group. "Lighting for Celebrations," by A. D. Charters.

BRISTOL.—Electricity House, Colston Avenue, 7.15 p.m. E.P.E.A. South Western Technical Group. "Supervisory Control," by L. J. Day.

LIVERPOOL.—Philharmonic Hall, 7.30 p.m. Merseyside Electric Lighting Services Committee. Public demonstration and lecture on "Research and the Lamp," by Dr. J. N. Aldington.

SHEFFIELD.—Grand Hotel, 7.30 p.m. Incorporated Plant Engineers, South Yorkshire Branch. "Oxygen in Industry": film.

STAFFORD.—Lecture Theatre, English Electric Co., Ltd., 7 p.m. I.E.E. South Midland Students' Section. "Some Tests on Large High-Speed Turbo-Alternators," by J. P. Harbord.

SWANSEA.—Guild Hall, 6.30 p.m. I.E.E. West Wales (Swansea) Sub-Centre. Faraday Lecture on "Light from the Dark Ages, or the Evolution of Electricity Supply," by A. R. Cooper.

Friday, 30th January

BIRMINGHAM.—Regent House, St. Philip's Place, Colmore Row, 6 p.m. I.E.S. Birmingham Centre. "Whither Lighting Design?" by A. J. P. Pashler and J. R. Anstey.

BOURNEMOUTH.—Municipal College, 7 p.m. E.P.E.A. Southern Technical Group. "11 kV and 33 kV Overhead Line Construction," by N. G. Simpson.

STOKE-ON-TRENT.—I.E.S. Stoke-on-Trent Group. Annual dinner.

Saturday, 31st January

LONDON.—I.E.E. London Students' Section, 10 a.m. Visit to Odeon Theatre, Leicester Square, W.C.2.

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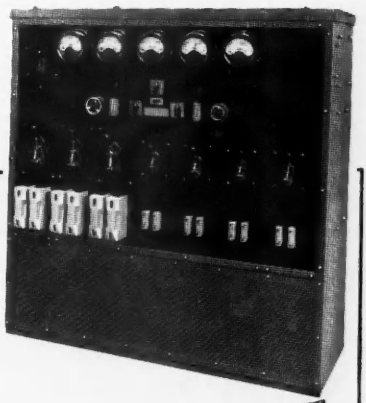

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948

2960. Johnson, C. A., Lubszynski, H. G., and White, E. L. C.—Television transmitting systems. 29th January, 1949. (688195.)

17253. Marconi's Wireless Telegraph Co., Ltd.—Coating metal parts with carbon. 26th June, 1948. (688196.)

23534. Automatic Electric Laboratories, Inc.—Toll circuits. 7th September, 1948. (688197.)

949

1342. Lubszynski, H. G., and White, E. L. C.—Television transmitting systems. 2nd July, 1949. (Divided out of 18974/48.) (688200.)

4642. Chamberlain & Hookham, Ltd., and Deacon, L. O.—Means for measuring the frequency of electric or mechanical impulses. 16th February, 1950. (688202.)

9996. Horwood, J. W., and Newman, R. J.—Construction of dipole high-frequency aerials. 10th July, 1950. (688204.)

14565. Foster Transformers & Switchgear, Ltd., and Jennings, R. E.—Alternating current electric arc welding systems. 30th May, 1950. (Cognate application 28562, 8th November, 1949.) (688376.)

28486. Diamond H Switches, Ltd.—Electrical energy regulators. 3rd November, 1950. (688264.)

1950

584. Ashley Accessories, Ltd., and Everitt, L. H. R.—Electric switches having a dolly or like pivoted operating member. 10th January, 1951. (688267.)

1904. Colvern, Ltd., and Collinson, R. F.—Variable impedance devices. 24th January, 1951. (688270.)

2200. Standard Telephones & Cables, Ltd.—Navigation aiding radio systems. 27th January, 1950. (688271.)

7749. Critchley Bros., Ltd.—Ferrule for electric cables. 27th March, 1951. (688278.)

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8204. Sonnenfeld, I.—Electric power cable. 26th June, 1951. (688279.)

9205. English Electric Co., Ltd.—Joints for electric conductors. 13th April, 1951. (688280.)

11522 & 11788. British Thomson-Houston Co., Ltd.—Magnetic amplifier circuits. 9th & 11th May, 1950. (688395/6.)

12242. Telegraph Construction & Maintenance Co., Ltd.—Manufacture of air spaced electric cables. 10th May, 1951. (688398.)

12668. Drage, G. E.—Heat-operated electric switches. 16th May, 1951. (688399.)

15011. Lignes Télégraphiques et Téléphoniques.—Means for winding tapes, metal ribbons, wires and the like on cores. 15th June, 1950. (688292.)

16421. Trist & Co., Ltd., R.—Magnetic devices.—1st October, 1951. (688402.)

17945. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 18th July, 1950. (688298.)

19307. British Thomson-Houston Co., Ltd.—Metal vaporizers. 2nd August, 1950. (688303.)

19426. British Thomson-Houston Co., Ltd.—Alkali metal salts or organosilicon compounds. 3rd August, 1950. (688407.) 19712. Organosilicon compounds. 8th August, 1950. (688408.)

19940. Rudin, P.—Electric generators. 10th August, 1950. (688301.)

22190. Western Electric Co., Inc.—Telephone switching systems. 8th September, 1950. (688413.)

23085. British Insulated Callender's Cables, Ltd.—Spindle-locking means. 19th September, 1951. (688314.)

23869. Babcock & Wilcox, Ltd.—Tubulous boilers. 29th September, 1950. (688416.)

24812. Belling & Co., Ltd., and Belling, C. R.—Electric fires. 13th August, 1951. (688321.)

25216. Automatic Telephone & Electric Co., Ltd.—Circuit arrangements for generating signals for use in telephone systems. 15th October, 1951. (688420.)

25802. Siemens-Schuckertwerke Akt.-Ges.—Mechanically regulatable rotating field machines. 23rd October, 1950. (688324.)

26018. British Thomson-Houston Co., Ltd., and Bourne, S. N.—Electric motor control systems. 5th October, 1951. (688325.)

28063. General Electric Co., Ltd.—Electric fuse elements for cartridge fuses. 29th October, 1951. (688327.)

28968. British Thomson-Houston Co., Ltd.—Electric motor reversing arrangements. 27th November, 1950. (688329.)

30365. Standard Telephones & Cables, Ltd.—Electromagnetic light-current contact making relays. 7th December, 1951. (688336.)

30769. Simmonds Aerocessories, Ltd.—Terminals for electric conductors. 7th November, 1951. (688338.)

1951

1076. British Thomson-Houston Co., Ltd.—Range scale markings for two scale plan position indicators. 7th December, 1951. (688431.)

2953. Office National d'Etudes & de Recherches Aeronautiques, O.N.E.R.A., and Centre National de la Recherche Scientifique, C.R.N.S.—Devices for producing electrified droplets. 6th February, 1951. (688433.)

4117. British Thomson-Houston Co., Ltd.—Methods of and apparatus for coating glass tubes. 20th February, 1951. (688346.)

4779. Cambridge Instrument Co., Inc.—Electrical recording instrument, particularly for an electrocardiograph. 27th February, 1951. (688235.)

9048. General Electric Co., Ltd., and Rousseau, J. E.—Automatic telephone systems. 19th February, 1952. (688241.)

10999. Anciens Etablissements Malber.—Electric welding processes. 10th May, 1951. (688244.)

11552. Philips Electrical Industries, Ltd.—Adjustable mounting attachments for loudspeakers, lamps and other apparatus. 17th May, 1951. (688358.)

11934. British Thomson-Houston Co., Ltd.—Clutch-brake mechanism. 22nd May, 1951. (688247.)

13611. Aksieselskapet Proton.—Contrivance for locking the front to the backing plate of an electric heating panel. 8th June, 1951. (688442.)

14127. Bendix Aviation Corporation.—Smoothing circuits. 14th June, 1951. (688443.)

14444. Albiswerk Zurich Akt.-Ges.—Electromagnetic relays. 18th June, 1951. (688444.) 14445. D.c. relays. (688445.)

15590. Van der Heem N.V.—Foot-operated electric switch-actuating means. 2nd July, 1951. (688447.)

16636. Allmanna Svenska Elektriska Aktiebolag.—Outlet valves for air-blast electric circuit breakers. 13th July, 1951. (688254.)

18443. Hazeltine Corporation.—Apparatus for modifying the apparent response of image-reproducing devices to unidirectional transients. 3rd August, 1951. (688452.)

18988. Fairweather, W. C. (Singer Manufacturing Co.).—Lighting device for sewing machines. 13th August, 1951. (688256.)

19281. Koulomzine, T.—Magnetometers. 15th August, 1951. (688454.)

24330. Philips Electrical Industries, Ltd.—Electrical connections. 18th October, 1951. (688362.)

24867. British Thomson-Houston Co., Ltd.—Electric fans. 24th October, 1951. (688364.)

25931. Philips Electrical Industries, Ltd.—Circuits for the demodulation of amplitude-modulated high-frequency oscillations. 6th November, 1951. (688366.)

27089. Philips Electrical Industries, Ltd.—Filters for suppressing rapid variations of a direct-voltage source. 19th November, 1951. (688369.)

27348. Foster Transformers & Switchgear, Ltd., and Jennings, R. E.—Electromagnetic relays. 30th May, 1950. (Divided out of 688376.) (688458.)

28024. British Thomson-Houston Co., Ltd.—Electric cord fasteners. 29th November, 1951. (688260.)

28417. Philips Electrical Industries, Ltd.—Electrical relays. 4th December, 1951. (688370.)

1952

808. Erie Resistor Corporation.—Electric circuits for thermionic valve sockets and methods of making same. 23rd August, 1948. Divided out of 688461. (688530.)

15625. Metropolitan-Vickers Electrical Co., Ltd.—Measuring or recording apparatus. 11th December, 1950. Divided out of 688549. (688609.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

7th February

THYRALUX. No. 709,672, Class 9. Electronic instruments and apparatus for controlling the intensity of electric lighting installations operated by alternating current.—Brown, Boveri & Co., Ltd., Baden, Switzerland. Address for service, c/o A. A. Thornton & Co., Napier House, 24–27, High Holborn, London, W.C.1.

CELSONA. No. 710,414, Class 9. Sound recording apparatus, microphones, electrical and electronic apparatus for selecting and sorting metal, and parts included in Class 9 of all such goods.—Excel Sound Services, Ltd., Norwood Works, off Norwood Avenue, Shipley.

SERVOMEX. No. 710,566, Class 9. Electronic instruments included in Class 9.—Servomex Controls, Ltd., Crowborough Hill, Jarvis Brook, Sussex.

CERELITE. No. 712,801, Class 11. Carbons for electrical purposes.—Charles H. Champion & Co., Ltd., National House, 60–66, Wardour Street, London, W.1.

14th February

No. 680,582 (design), Class 9. Electric flat irons; and electrical apparatus in Class 9 for use in controlling the flow of current to electric cooking or heating stoves or to electric water heaters.—Allied Ironfounders, Ltd., Mortimer House, 37–41, Mortimer Street, London, W.1.

NULUX.—No. 709,769, Class 9. Electric flat irons.—T. Price & Son (Stampers), Forward Works, Spring Hill Passage, Birmingham, 18.

MINICON.—No. 710,098, Class 9. Television cameras and television camera pick-up tubes for the reproduction of pictures in television transmission.—Cathodeon, Ltd., Meadowcroft Laboratories, Church Street, Cambridge.

TELEVIDOR (design).—No. 711,920, Class 9. Television apparatus.—Vidor, Ltd., 681, Salisbury House, Finsbury Circus and London Wall, London, E.C.2.

MAGIFLEX.—No. 712,445, Class 9. Electric cables and insulated wire.—B. Zucker, 138a, Cromwell Road, London, S.W.7.

TELSTOR.—No. 712,659, Class 9. Electronically operated level indicators.—Fielden (Electronics), Ltd., Paston Road, Wythenshawe, Manchester.

NONAME.—No. 712,698, Class 9. Cables included in Class 9.—Shardlow Electric Wires, Ltd., Moseley Buildings, 56, Moseley Street, Manchester.

PERCON.—No. 713,130, Class 11. Lighting fittings.—Hartley Electromotives, Ltd., 1a, Harrington Road, London, S.W.7.

Automatic Switches

IN a talk recently given to the Newcastle Branch of the Horological Institute by Mr. W. A. Devon (London area manager of Venner, Ltd.) details were given concerning the manufacture of clocks, time switches and other automatic switching equipment, and the applications to which these devices were put for industrial, municipal and domestic purposes.

Pointing out that every phase of production was devised to aid good timekeeping and reliability, Mr. Devon spoke of the utilization of special raw materials and instanced the case of the specially made brass for clock plates. Most of the finished components which went into time switches and clocks were made on automatic machines, chiefly of Swiss manufacture, with chuck speeds up to 6,000 r.p.m.

Mr. Devon explained the inter-operational inspection to ensure the maintenance of quality of products and described special types of timers, such as that made for the Marconi Company for operating unmanned radio transmitters, master and slave equipments for controlling the thickness of chocolate on chocolate biscuits, special switches for the automatic control of boiler stokers, and switches designed to extend the apparent daylight to increase egg production from chickens.

A similar talk was given by Venner's Midland area manager, Mr. E. Selley, to the Nottingham Branch of the Horological Institute.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—SYDNEY.—12th March. County Council. L.v. high rupturing capacity fuse cartridges, carriers and bases. (C.R.E. 1289/53. Ten/5541.)*

Belfast. — 5th February. City Council. Electrical installation in the servery, St. Anthony's Primary School. Education Architect's Department, Academy Street.

Canada.—WINNIPEG.—9th February. Manitoba Hydro-Electric Board. Main control switchgear, station service transformers and switchgear and station service bus work for McArthur Falls Development. (C.R.E. 1723/53. Ten/5539.)*

9th February. Winnipeg Hydro-Electric System. Supply of 3,000 kVA transformer. (C.R.E. 1721/53. Ten/5538.)*

Coventry. — 31st January. City Council. Coronation decorations equipment. (See this issue.)

Crayford.—9th February. U.D.C. Supply of electrical goods and electric boilers, for one year. Surveyor, Town Hall.

Gillingham (Kent).—2nd February. Town Council. Supply of switches and accessories; conduit and accessories; wire, cable and accessories; electric cooker, wash boiler and fire spares; and electric lamps, for one year. Borough surveyor, Municipal Buildings.

India.—DELHI.—Directorate General of Supplies and Disposals, Government of India. M.F. radio beacon for False Point Lighthouse. C.R.E. 44034/52. Ten/5484.)*

Iraq. — BAGHDAD. — 19th March. Central Foreign Purchase Committee, Ministry of Finance. X-ray apparatus. (C.R.E. 1239/52. Ten/5517.)*

30th April. District Water Board. Supply of electrically-driven pumping plant. (C.R.E. 1238/53. Ten/5508.)*

London.—17th April. India Store Department. Amplifiers. (See this issue.)

HAMMERSMITH. — 13th February. Hammersmith, West London and St. Mark's Hospitals. Supply of electric lamps for one year. (See this issue.)

SOUTHWARK.—4th February. Borough Council. Supply of electric lamps for one year. D. T. Griffiths, town clerk, Walworth Road, S.E.17.

STEPNEY.—9th February. Borough Council. Electrical installations in library building and welfare centre. (See this issue.)

WANDSWORTH.—Borough Council. Electrical contractors wishing to be placed on the Council's list for electrical installation work should submit applications by 18th February. (See this issue.)

Maidstone. — 2nd February. Corporation. Electrical installations in Council houses. Borough surveyor, Palace Avenue.

Manchester.—16th February. City Council. Rewiring electrical installation, together with certain additions, at the Special School, Buglawton Hall, Congleton. City architect, Town Hall.

South Africa. — JOHANNESBURG. — 11th February. Stores Department, South African Railways. Train electric lighting fittings. (C.R.E. 849/53. Ten/5505.)*

CAPE TOWN. — 6th May. City Electricity Department. Supply of 66 kV and 33 kV cables, jointing material and ancillary equipment. (C.R.E. 760/53. Ten/5506.)*

Stoke-on-Trent.—2nd February. Borough Council. Supply of electric lamps for six months. City surveyor, Town Hall.

Uruguay. — MONTEVIDEO. — 27th February. Administracion General de las Usinas Electricas y los Telefonos del Estado. Supply of 6.3 kV circuit breakers. (C.R.E. 1471/53. Ten/5512.)*

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

ORDERS PLACED

Coventry.—Education Committee. Part of electrical installation at Woodlands Comprehensive Secondary School, Broad Lane (£6,945).—Lee, Beesley & Co., Ltd.

Glasgow. — Corporation. Rewiring and change-over of electrical installation from d.c. to a.c. at Treron's Premises, Sauchiehall Street (£4,976).—B. French, Ltd.

London.—L.C.C. Electrical installation at Bonner County Primary School, Bethnal Green (£2,499).—Alexander Hawkins & Sons, Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Addington.—Houses (22). Gravel Hill; Properties (Tulse Hill), Ltd., 353, Norwood Road, S.E.27.

Alnwick (Northumberland). — Bus station; United Automobile Services, Ltd., Darlington.

Ampthill.—Police station (£30,000); S. C. Jury, county architect, Shire Hall, Bedford.

Ashford (Kent).—Houses (86), Great Burton estate; G. E. Wallis & Sons, Ltd., Broadmead Works, Maidstone.

Aveley (Rainham).—Large shopping centre proposed (about £338,000) for L.C.C.; director of housing, County Hall, Westminster Bridge, S.E.1.

Aylesbury.—Houses (56) on site at Southcourt; borough engineer.

Barkingside.—Shops (18), with dwellings over, in High Street; Suburban Developments, Ltd., Eastern Avenue, Ilford.

Belfast.—Schools at Ballygomartin (£300,000), and Ben Madigan (£150,000); city surveyor, City Hall, Donegall Square.

Birmingham. — Houses at Bell Holloway estate, Northfield (76), Brandwood Road, King's Heath (36), Gerrard Street, Lozells (12), and Hawkhurst Road, King's Heath (6); H. J. Manzoni, city engineer, Civic Centre, 1.

Bolton.—Houses and bungalows (72), on three sites; P. S. Rennison, town clerk, Town Hall.

Bridgnorth. — Houses (158), Monkhopton, Chetton, Neenton, Eudon George, Stottesdon and Highley; Bertram Butler & Co., architects to R.D.C., 6, Tettenhall Road, Wolverhampton.

Brighton.—Flats (12) and garages (6), Section 1.F at Hollingdean estate; Knight Bros. (Brighton), Ltd.

Burton Latimer. — Houses (24), Finedon Road, for U.D.C.; Brown, Stokes Bros., Ltd., Higham Ferrers.

Bury.—Conversion of "South View," Wilson Street into hostel for aged (£10,700); borough engineer.

Cardigan. — Houses (100), Greenland Meadows; borough surveyor.

Chard.—Housing scheme at Forton Road site; F. W. Searle, town clerk, High Street.

Corby.—New factory; John White (Rushden), Ltd.

Dudley.—Clinic at junction of Stourbridge Road and Pensnett Road; borough surveyor.

Dukinfield.—Houses (96), Yew Tree Lane No. 2 site; Cruikshank & Seward, architects, 16, Princess Street, Manchester.

Durham.—Shops and flats on the Sunderland Road estate; city engineer, Town Hall.

Easington (Co. Durham).—Houses (28), Thornley, for R.D.C.; Veti & Edwards, builders, Sunderland.

East Kilbride.—Primary school for Scottish Education Department; Wm. Watt, Co., architects, Albert Street, Motherwell.

Gateshead.—R.C. church, presbytery and hall in Consett Road; Burke, architect, Lambton Road, Newcastle-on-Tyne.

Hull.—Technical college; J. Roger Preston & Partners, consulting engineers, Dilke House, Malet Street, W.C.1.

Lancaster.—Houses (650), Aldcliffe estate; city engineer.

Liverpool. — Ten-storey block of flats at Sparrow Hall estate; city architect.

London.—KENSINGTON.—Flats (44), Colville Gardens, Finborough Road, and Cambridge Gardens; borough engineer.

MAYFAIR.—Hotel, New Bond Street and Conduit Street; Michael Rosenauer, architect, 86, Brook Street, W.1.

SOHO.—Rebuilding shops and flats, Old Compton Street; Bernard Sunley & Sons, Ltd., 34, St. James's Street, S.W.1.

Luton.—Houses (124), Westmorland estate; Selleck, Nicholls & Co., Ltd., builders, East Hill, St. Austell.

Maesteg.—Pithead baths, medical centre and canteen at colliery; National Coal Board, Cambrian Buildings, Mount Stuart Square, Cardiff.

Manchester.—New classrooms at St. Margaret Mary's School, New Moston, Manchester; Greenhalgh & Williams, architect, 10, Mawdsley Street, Bolton.

Newcastle-on-Tyne.—Houses (264), Fairways site, city architect, 18, Cloth Market.

Northampton.—Residential block for aged people at Kings Heath; borough architect.

Bulk storage plant, Dallington Fields industrial estate; Esso Petroleum, Ltd., 376, Oxford Street, W.1.

Northfleet.—Primary infants' school; Scott & Westmoreland, architects, 25, Bedford Row, W.C.1.

Nuneaton.—Houses (101), Camp Hill estate; shops on sites at Camp Hill and Vernons Lane; town clerk, Council House.

Oldbury.—Houses (62), Tinkers Farm estate; S. H. Rowe (Quinton), Ltd., Edgbaston Road, Birmingham.

Orpington.—Church hall for St. Barnabas' Church; Ansell & Bailey, architects, 12, Gray's Inn Square, W.C.1.

Poole.—Works extensions; Loewy Engineering Co., Ltd., Lindsay Road, Westbourne.

Sandbach.—New maternity unit at Arclid Hospital; Cooper Bros. & John Clayton, Ltd., Macclesfield.

Southport.—Mental deficiency colony, Banks; Liverpool Regional Hospital Board architect, 88, Church Street, Liverpool.

Spalding.—Pumping station for R.D.C. water supply scheme; Silcock & Simpson, consultants, 10, Park Row, Leeds.

Taunton.—Houses (200), Lyngford estate; borough housing architect, 2, Baldwin Road.

Vaynor and Penderyn.—Houses (100), at Trefechan, and 58 on three other sites, for R.D.C.; E. J. H. Hughes, surveyor, 25, Victoria Street, Merthyr Tydfil.

Walton-on-Thames. — Flats (30), Rydens Road; U.D.C. surveyor.

Warrington.—New R.C. Church at Orford estate; Massey & Greaves, architects, 10, Museum Street, Warrington.

Wokingham.—Dwellings (86), Norreys Barn estate; Gee, Walker & Slater, Ltd., builders, 100, Park Lane, W.1.

Worthing. — Bungalows (55), Field Place estate; W. J. Stratton, Ltd., Colebrook Close.